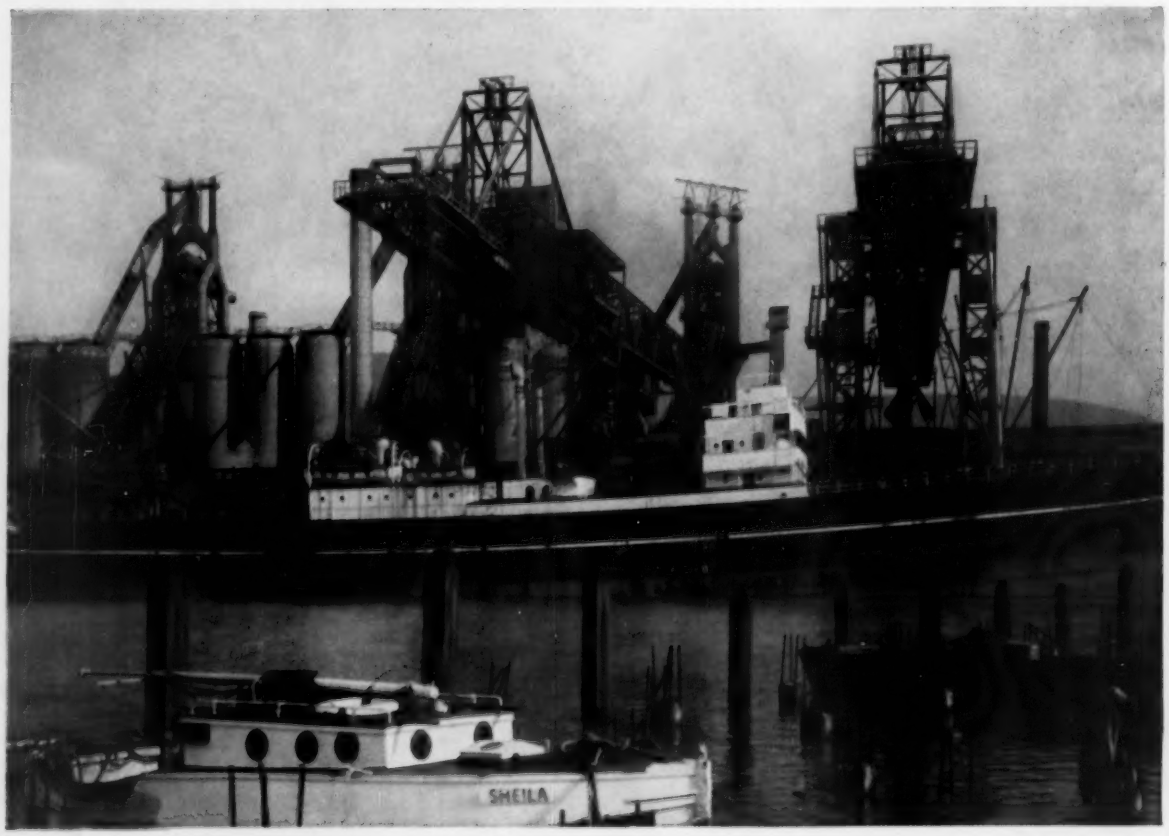
21 JULY 1955 ONE SHILLING

ELECTRICAL TIMES



Giant Ore Unloaders use BICC CURRENT COLLECTION EQUIPMENT

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Giant Ore Bridge Unloaders span the ships, stockyards and furnace bunkers at Port Talbot Docks. Electrically operated (at 3,300 volts) they are each capable of unloading ore at the rate of 500 *tons an hour.*

The Current Collection Equipment has been specially designed by BICC for high voltage operation, and to withstand the strain of continuous use in a marine and abrasive atmosphere.

BICC specialise in the design and supply of Current Collection systems for all types of cranes and conveyors. Publication No. 271, available on request, tells you more about the range of this equipment.

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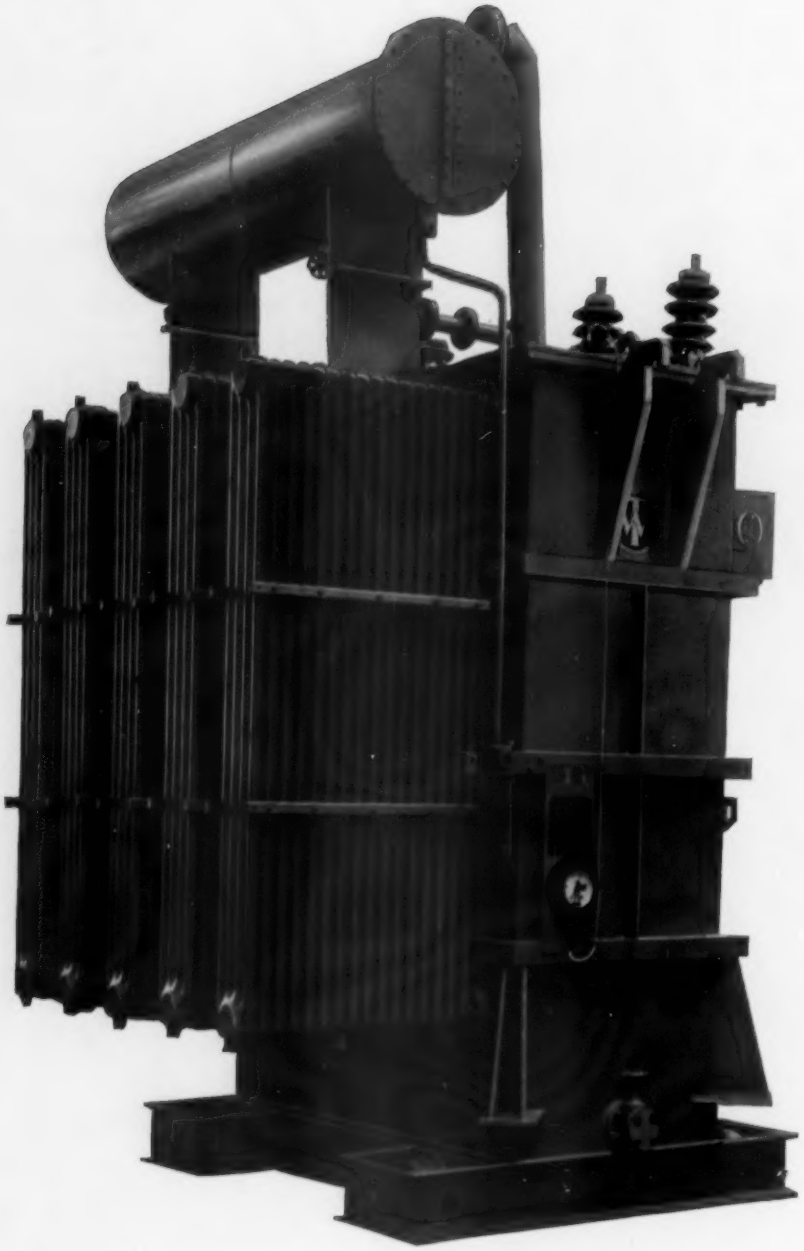

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UNIVERSAL AVOMETER

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Produced in response to a demand for a high sensitivity version of the world-famous Universal AvoMeter, this model incorporates the traditional design features of its predecessors, so highly valued for simplicity of operation and compact portability.

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Size 8½" x 7½" x 4½"
Weight 6½lbs. (including leads)

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For your Valve Characteristic Meter or Valve Tester

Owing to the very large number of valves which have been issued within the last two years, no further amendments will be issued for the original "AVO" Valve Testing Manual. A new, completely revised and fully up-to-date Valve Data Manual is now available from the Company at 15/- post free.

D.C VOLTAGE	D.C. CURRENT	A.C. VOLTAGE	A.C. CURRENT	RESISTANCE
2·5V.	50μA.	2·5V.	100mA.	*First indication* 0·5Ω
10V.	250μA.	10V.	1A.	*Maximum indication* 20MΩ.
25V.	1mA.	25V.	2·5A.	0—2,000Ω — using internal batteries.
100V.	10mA.	100V.	10A.	0—200,000Ω — using internal batteries.
250V.	100mA.	250V.	—	0—20MΩ — using internal batteries.
1,000V.	1A.	1,000V.	—	0—200MΩ — using external batteries.
2,500V.	10A.	2,500V.	—	

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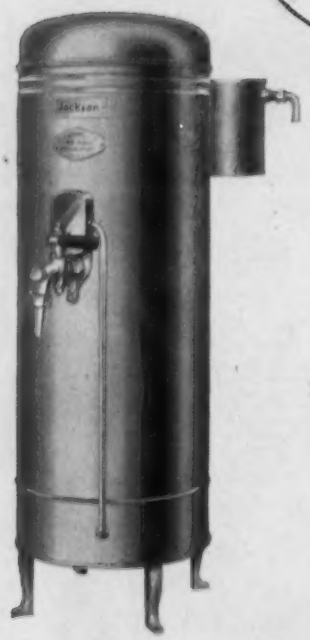

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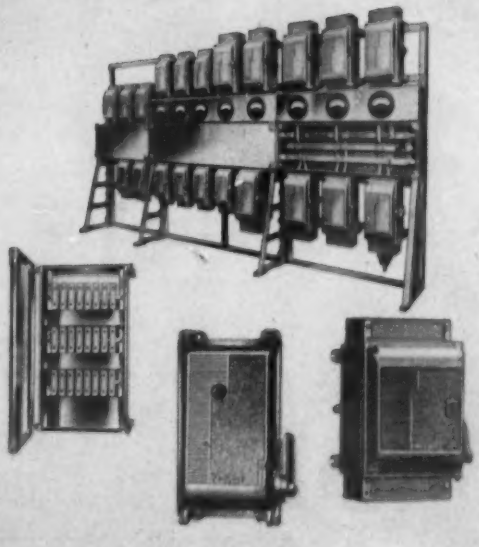

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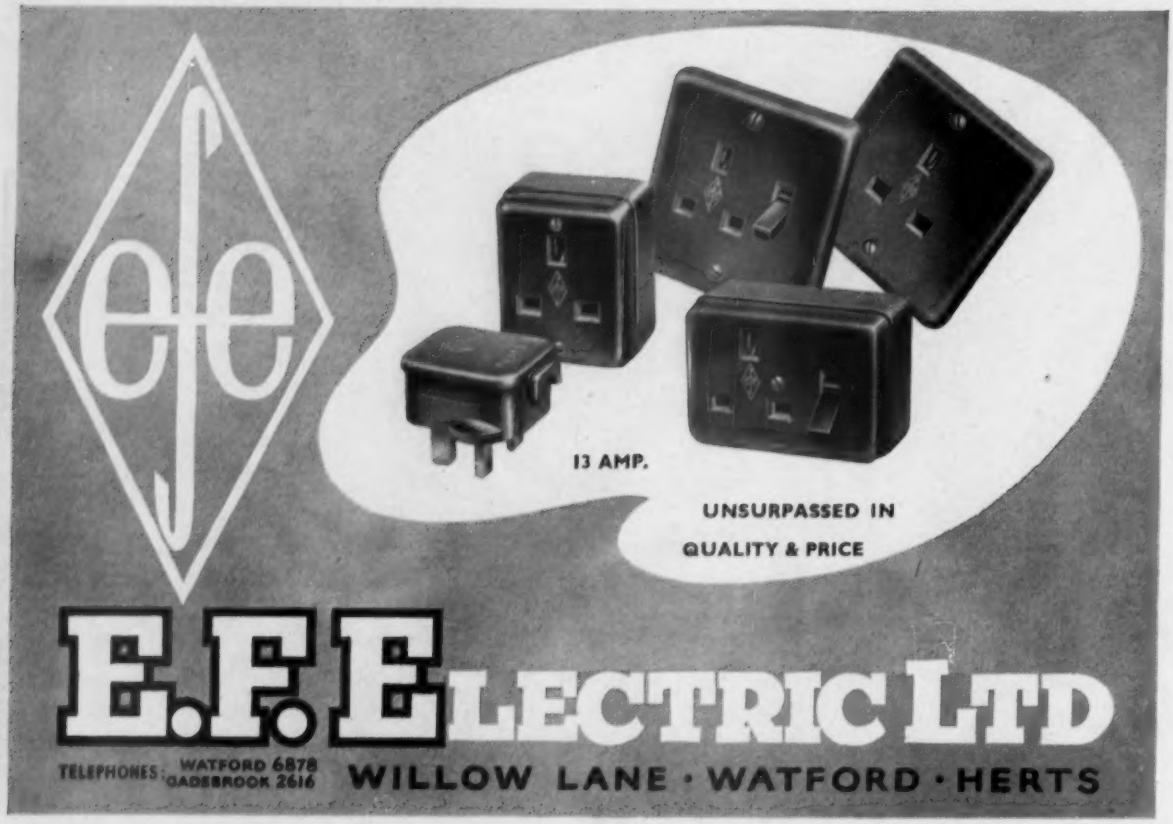

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1,500 SWITCHINGS PER HOUR

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Left:
View of Unit

Below:
View of Housing

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Solid Silver Contacts for Extra Long Life · Minimum of Working Parts · Absolute Silence on A.C. · Two Screw Fixing and Easy Wiring · No Maintenance Up to Two Auxiliaries · Neutral Terminal. This B.K.S. Contactor is of compact design and is ideal for reversing duty, lift work, control of industrial processes, and thermal storage systems, etc. It can be supplied for panel mounting, in multi units in steel housings, or as motor starters. It is a precision built unit easily installed, and will give continuous duty, coupled with minimum servicing.

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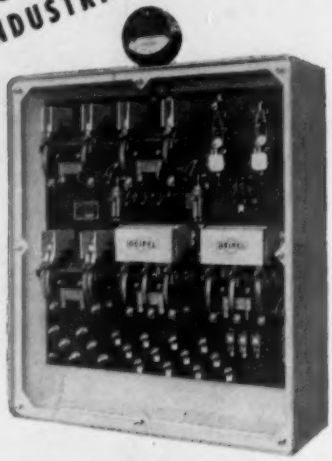

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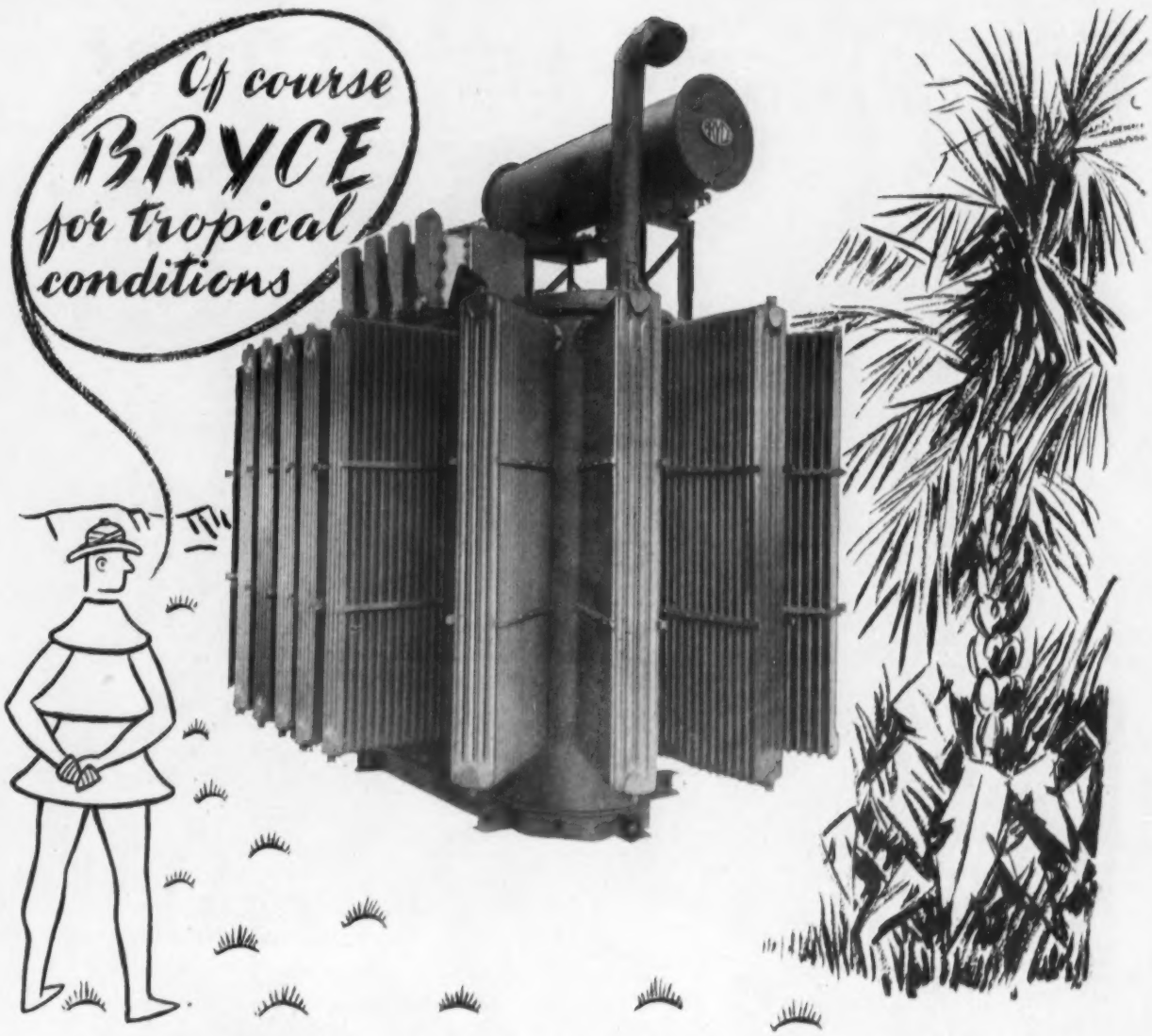

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THE design, manufacture and materials of BRYCE Transformers are such that no matter what the service conditions, dependability is assured. For Equatorial Africa, for instance, the job is planned from the first to take into account varying temperatures, humidity and other conditions applicable to this region. That's why you should always consult BRYCE before ordering Power Transformers.

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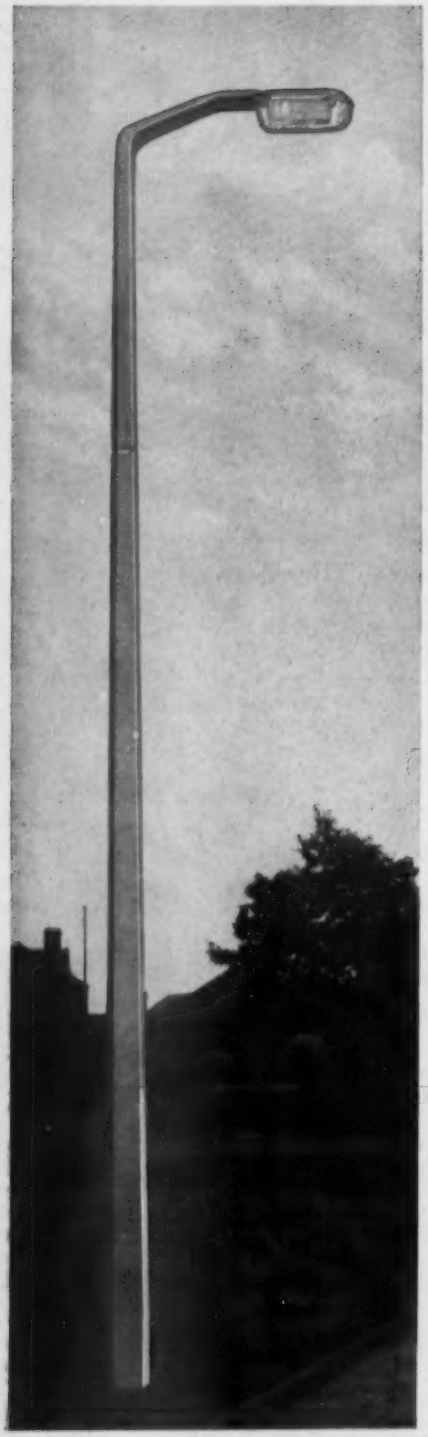


"Epic" spun artificial stone column to B.S. Specification. For Group "A" roads. Approved by the Council of Industrial Design.

STREET LIGHTING

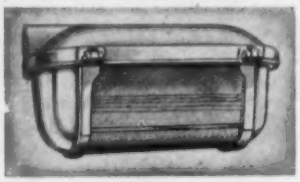
Columns & Fittings by REVO REGD.

For close on half a century, the name Revo has been associated with the best in street lighting and the selection shown on this page is merely representative of the wide range in current production.

The Company's Technical Staff will be pleased to advise on all aspects of Public Lighting and the Revo Street Lighting Erection Department is available for the installation of equipment.

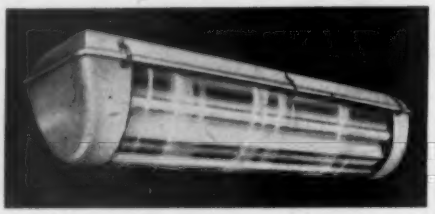
Details and catalogues will gladly be sent to interested authorities who are invited to forward their inquiries without obligation.

C13594 "Silverblue" street lighting fitting for use with mercury vapour discharge lamps. Available for top or side entry mounting. Group "A" roads.



C13723 "Silvergold" street lighting fitting for use with sodium vapour discharge lamps. Group "A" roads.

"Sol-Etern" street lighting fitting for use with 2, 3 or 4 —5 ft. fluorescent lamps. Group "A" roads.



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Two 60,000-kW, 2-cylinder, 3,000-r.p.m. BTH turbo-alternators installed in this C.E.A. Power Station in London have demonstrated in remarkable fashion the suitability of the design to meet the most severe shift operating conditions. Indeed, on many occasions these machines—which operate under steam conditions of 900 lb. per sq. in. g. at 900°F—have been run up and shut down twice in one day.

No. 1 Set has been started up and loaded 539 times in 2¼ years.
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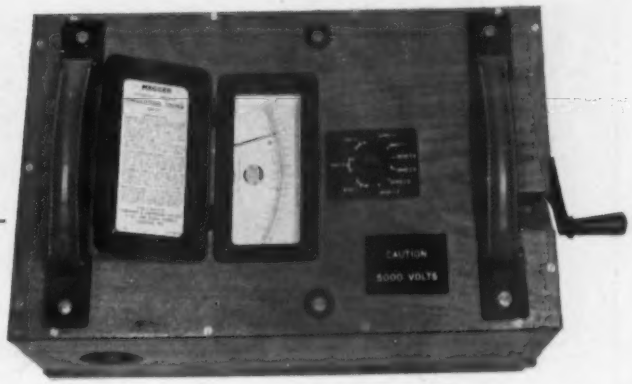

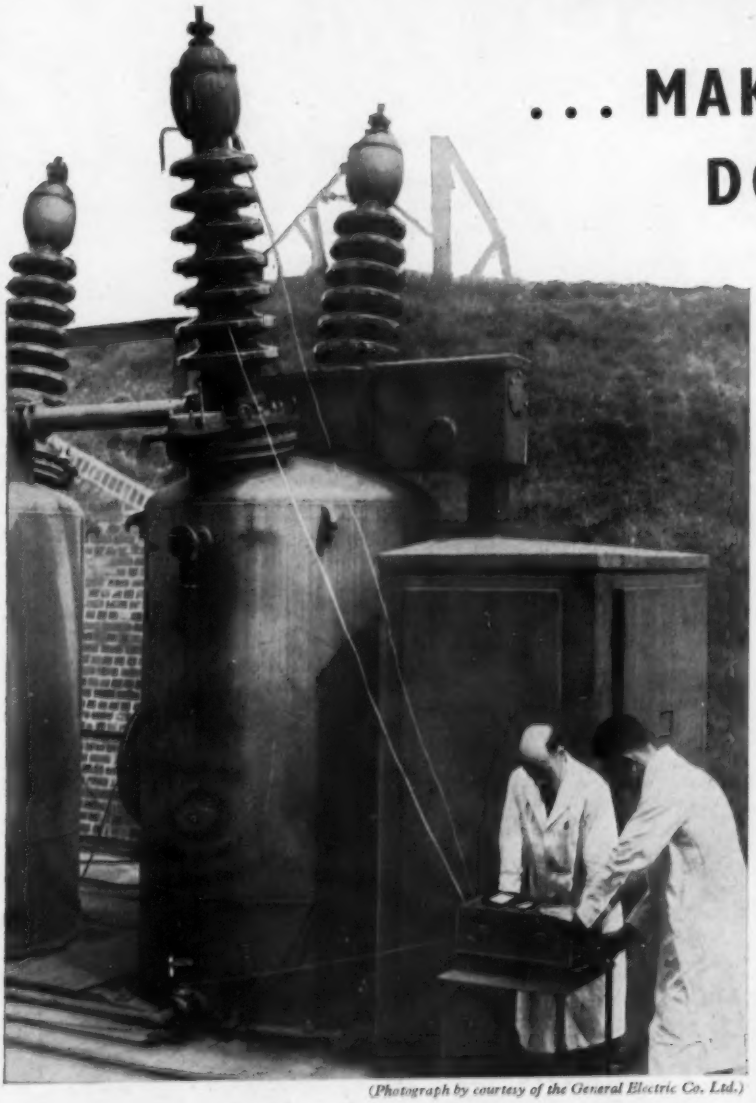

(Photograph by courtesy of the General Electric Co. Ltd.)

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AT THE WITTON WORKS OF THE GENERAL ELECTRIC COMPANY

Insulation resistance tests are carried out both before and after a circuit breaker has been tested at its rated rupturing capacity. Any damage to the insulation is thus disclosed.

The illustration shows a 5,000 volt Megger Insulation Tester being used to check the insulation resistance of the bushings and moving contact insulation of one phase of a 132 kV, 3,500 MVA oil circuit breaker.

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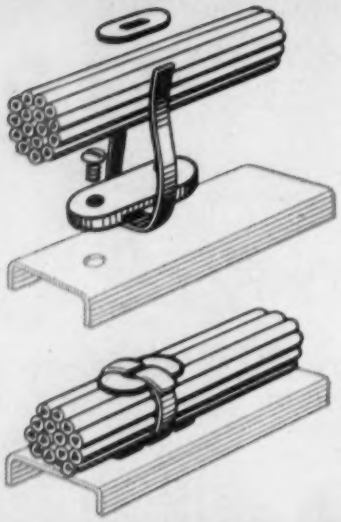


THE BETA SYSTEM USES 4 COMPONENTS ONLY

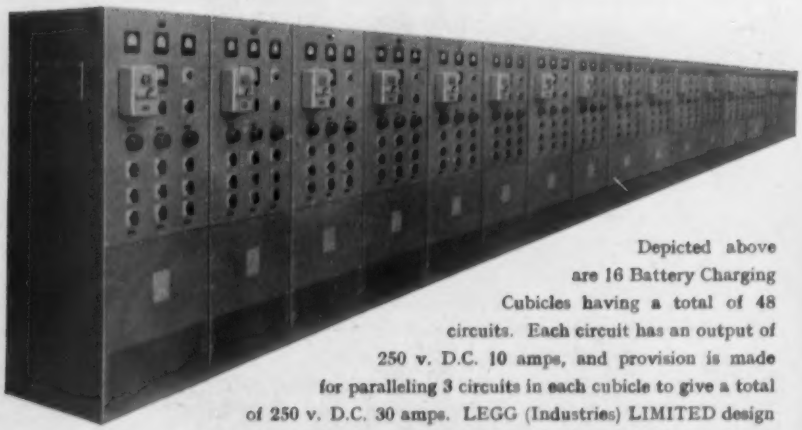
1. A moulded saddle
2. A standard 4 B. A. or self-tapping screw
3. A length of BETA strip
4. A plastic buckle

All components except screw, which is sunk, are fully insulated and can be safely used with unbraided P. V. C. cables.

Send for fully descriptive leaflet and prices

CRITCHLEY BROS LTD. BRIMSCOMBE STROUD GLOS. Phone BRIMSCOMBE 2208

16 BATTERY CHARGING CUBICLES



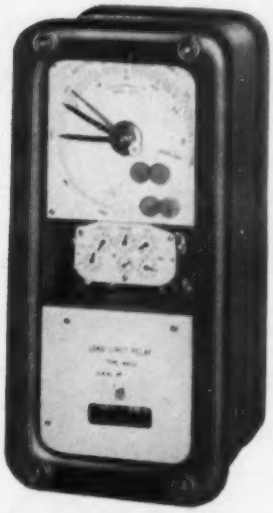
Depicted above are 16 Battery Charging Cubicles having a total of 48 circuits. Each circuit has an output of 250 v. D.C. 10 amps, and provision is made for paralleling 3 circuits in each cubicle to give a total of 250 v. D.C. 30 amps. LEGG (Industries) LIMITED design and manufacture equipment incorporating metal rectification for all purposes where a D.C. supply is required from an A.C. source, also Transformers, Air Cooled and Oil Immersed, up to 150 kVA Capacity.

Legg (INDUSTRIES) LTD · WILLIAMSON ST · WOLVERHAMPTON

This panel has been specially designed and manufactured for an overseas customer.

A section of the rear view of 3 typical cubicles.

Transva kVA Demand Meter (with or without alarm contact).



Types MASA and MASI Relays. For the limitation of kVA demand.

MODERN TARIFFS require modern methods of LOAD CONTROL

Metrovick equipment for power-factor control and M.D. limitation has been designed by specialist engineers and is fully up-to-date. It can make possible substantial savings in your electricity account.

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Type NJO4 Relay for the Automatic Control of the Single-stage Capacitors used for power-factor improvement.

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are Surrey switches, installed in Rye House Power Station, Hoddesdon, Herts.

Surrey switches were specified by the Eastern Division of the Central Electricity Authority for use throughout the administration blocks of their three newest Power Stations. Sufficient recommendation for quality and reliability of these unique switches.

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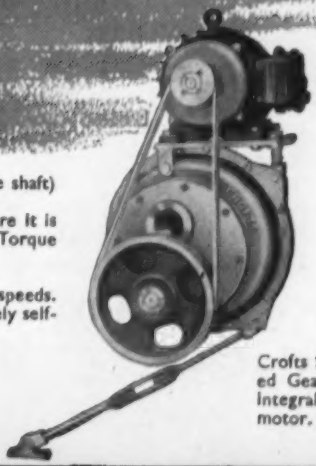
Crofts Shaft Mounted Gear Units are a development of our well-tried Floating Drive (live shaft) construction.
Fitting or removal is simple. The Unit is mounted direct on to the machine shaft where it is securely locked in position. No Foundations, Baseplates or Couplings are required. The Torque Reaction Bar anchors the units and provides adjustment for the V belt drive.
Bushes are available to accommodate a wide range of shaft diameters.
Units can be fitted with Taper Bush Pulleys which can be quickly changed to give alternative speeds.
Motors may, in specially selected cases, be mounted on the gearcase providing a completely self-contained drive, as illustrated.



Crofts Shaft Mounted Gear Unit with integrally mounted motor.

Crofts (ENGINEERS) LIMITED. BRADFORD 3. ENGLAND
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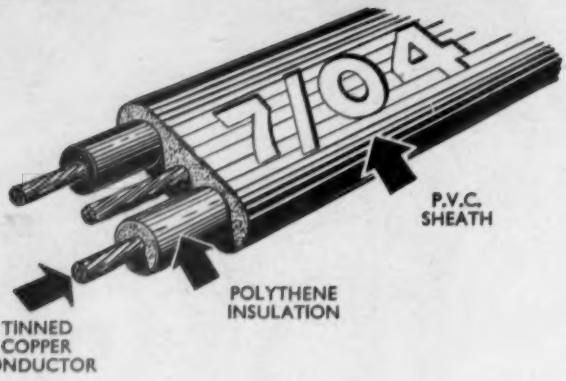

SAVE ON MATERIAL

ASHATHENE is a tough yet flexible cable with tinned copper conductors insulated with polythene. The cores are colour coded in accordance with B.S.S. and I.E.E. requirements to provide ready identification. Thanks to the p.v.c. sheathing, the cable may be embedded in plaster or cement without any deterioration occurring.
Armoured ASHATHENE cables are also available for power wiring and provide that extra mechanical protection usually required in factory installations.

SAVE ON LABOUR

ASHATHENE is already established as cable which enables a safe and permanent electrical installation to be made in less time and at lower expenditure.
Time spent on conduit bending and screwing may be eliminated since ASHATHENE readily cleats into position along girders, walls, etc. ASHATHENE is easily manipulated and strips cleanly and quickly. You are invited to send for leaflets and technical data which deal with electrical and mechanical characteristics and notes on wiring methods. ASHATHENE is manufactured to B.S.S. 1557 in the types where this specification is applicable.

ASHATHENE IS COMPETITIVELY PRICED THROUGHOUT THE WIDE RANGE OF ARMOURED AND NON-ARMOURED TYPES.

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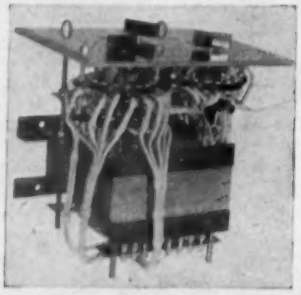
WATFORD, HERTS.
WATFORD 3422

THE **NEW "MIDCOIL"** variable output **TRANSFORMER**

WITH SUPERFINE VOLTAGE CONTROL AND

OUTPUTS UP TO 20 KVA

Example: 0–280 volts, variable from zero to full voltage in finely graded steps giving control throughout the range to within 0·2 volt at full load with extremely **GOOD REGULATION.**



Of particular interest to **DESIGNERS** of test equipment and with many other **INDUSTRIAL USES**, such as electric furnaces, etc.

FULL DETAILS and **PRICES** on request.

THE MIDLAND COIL WINDING COMPANY LTD.

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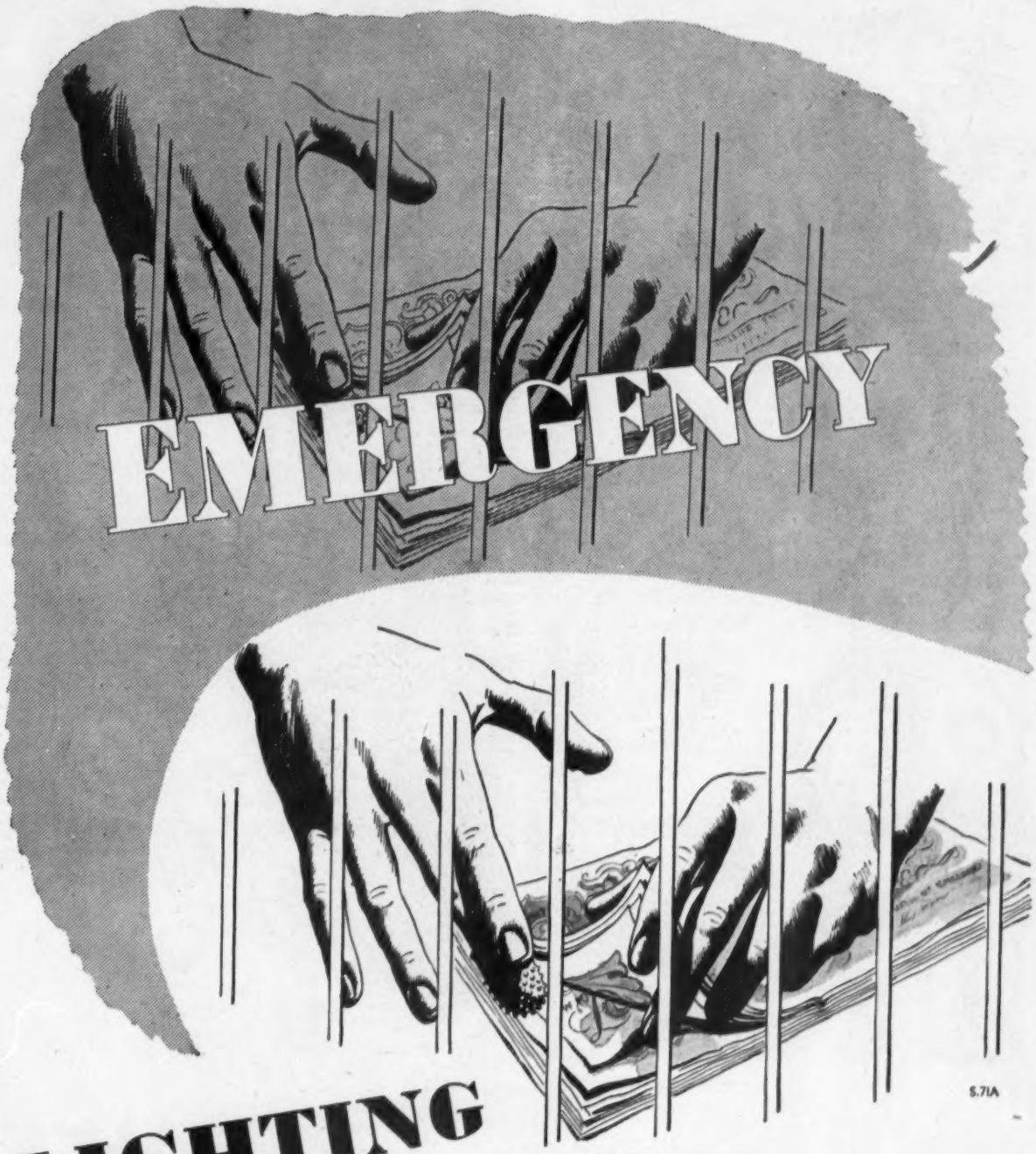
PHONE: ASTON CROSS 1011 **GRAMS: "MIDCOIL, BIRMINGHAM"**



LIGHTING

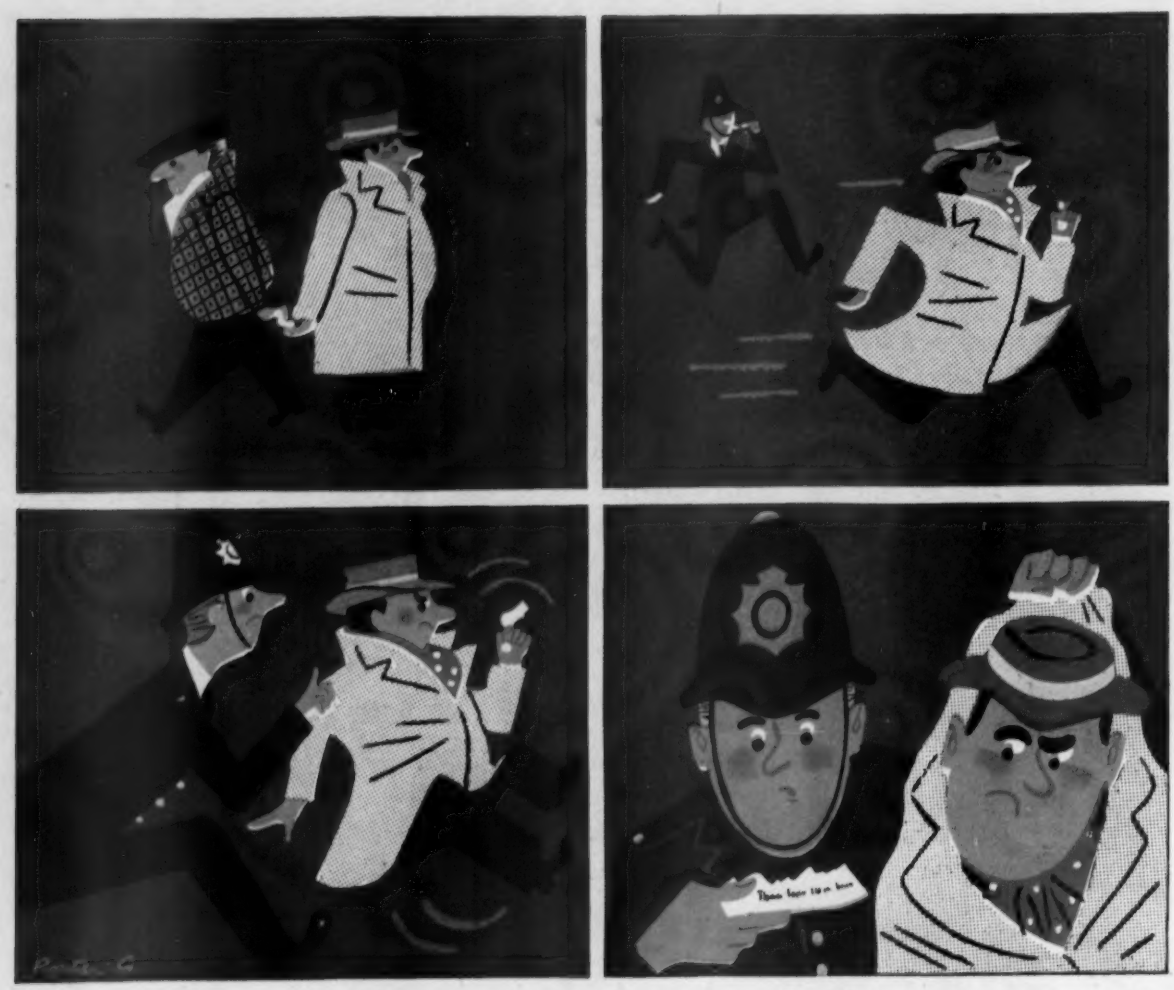
In Banks, as in all buildings in which sudden darkness can impose the risk of theft, emergency lighting is a necessary precaution. In bank buildings of the future the standby electrical system will be planned at the same time as the main lighting is planned. Chloride Batteries Ltd, makers of Keepalite, the automatic emergency lighting system, offer the advisory services of their engineers to architects and electrical contractors in any part of Britain.

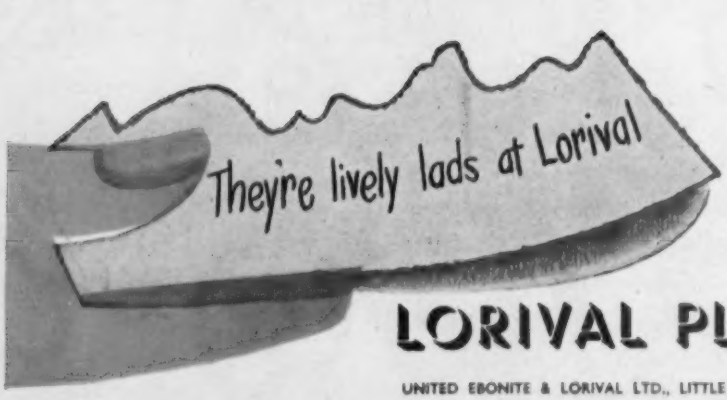
Keepalite

FOR BANKS

A Product of Chloride Batteries Limited, Exide Works, Clifton Junction, Swinton, Manchester and Grosvenor Gardens House, Grosvenor Gardens, SW1

You can't run away from it!





Here's an arresting thought. When you want something moulded in plastics — leave it to Lorival. They're lively lads at Lorival. They'll do the job at the lowest possible cost in the fastest possible time. You can put your shirt on it!

LORIVAL PLASTICS

UNITED EBONITE & LORIVAL LTD., LITTLE LEVER, Nr. BOLTON, LANCS. L-61

Balanced load meters for switchboard mounting

- Flush panel mounting with simple and secure fixing arrangements.
- Appearance matches with "six-inch-square" instrument cases.
- Available for registering kW h on polyphase three or four wire circuits.
- Obtainable for whole currents up to 100 amp. 600 volts and for operation from instrument transformers.
- Type A41M meters are described in Publication MS/2010.

'ENGLISH ELECTRIC'

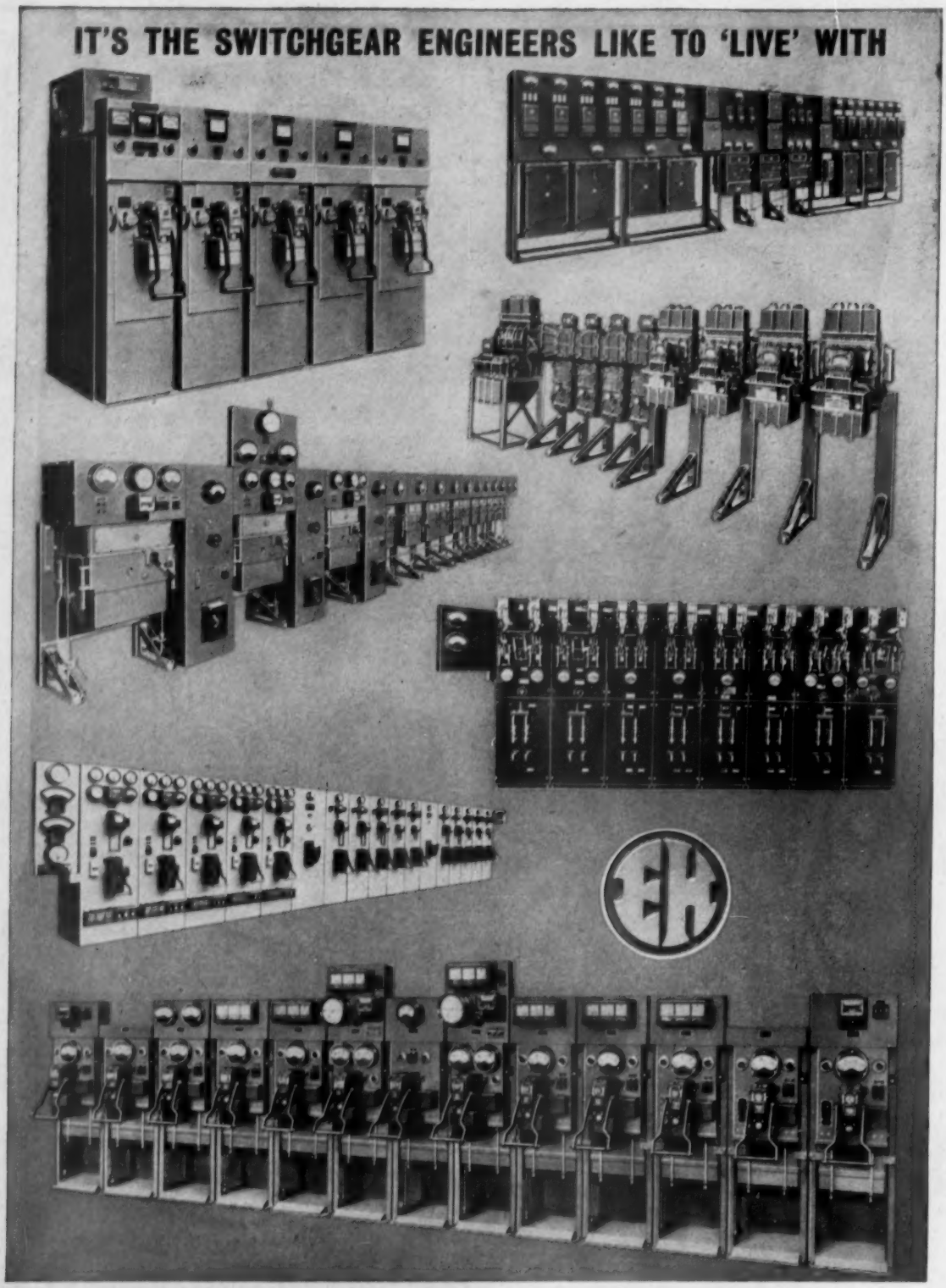
polyphase meters

THE ENGLISH ELECTRIC COMPANY LIMITED, QUEENS HOUSE, KINGSWAY, LONDON, W.C.2

Meter, Relay and Instrument Division, Stafford

MS.32C5 WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON

IT'S THE SWITCHGEAR ENGINEERS LIKE TO 'LIVE' WITH

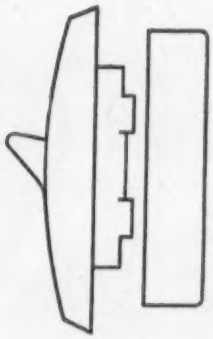


ERSKINE, HEAP & Co LTD
SWITCHGEAR SPECIALISTS
Head Office & Works: BROUGHTON, MANCHESTER (7)
London Office: GRAND BUILDINGS, TRAFALGAR SQ., W.C.2
BRANCH OFFICES AND AGENCIES IN ALL PARTS OF THE WORLD

L. T. SWITCHGEAR 50/5000 Amperes
E.H.T. SWITCHGEAR
up to 11 kv 250 MVA rupturing capacity
MOTOR CONTROL GEAR ¼/5000 H.P.

Welcome to our STAND Nos. 34 & 35 Gallery, Grand Hall, ENGINEERING MARINE & WELDING EXHIBITION, OLYMPIA, LONDON, SEPT. 1-15th

MK 108DHB

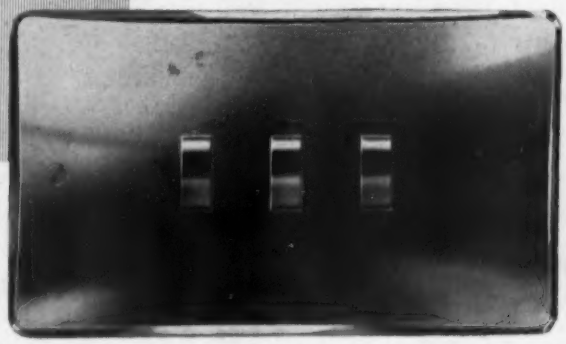


Minimum projection enables the new Plateswitch to fit into plaster-depth boxes with ample wiring room.

A new range of Plateswitches for plaster-depth boxes

MK

the mark of leadership



Following the very successful reception of the first range of MK Plateswitches, we are now introducing new designs for mounting in plaster-depth boxes. These switches will be welcomed by contractors who prefer a box that fits on the face of the brickwork.

The new range, which includes a three-gang pattern, has many outstanding features. They are described in detail in Leaflet 233.

Write today for your copy.

M. K. Electric Limited, Wakefield Street, London N.18 Edmonton 5151

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TUBULAR SHEATHED HEATING ELEMENTS

are suitable for the majority of heating problems – here is one of many applications

Metal Refining Apparatus

Our business is solving heating problems — can we help you?

BACKER ELECTRIC COMPANY LIMITED

FITZWILLIAM ROAD · ROTHERHAM · YORKS

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THIS High Temperature Electrical Insulating Material conforms to "Class H" requirements for working temperatures up to 180° C. Tape is available in 25 yd., 36 yd. and 50 yd. rolls in widths from ½" upwards, and our standard size for sheets is approx. 35" square.

We can offer Prompt Delivery at Competitive Prices, and shall be pleased to receive your enquiries.

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EAST LONDON MICA WORKS

RINGWOOD RD., WALTHAMSTOW, LONDON, E.17

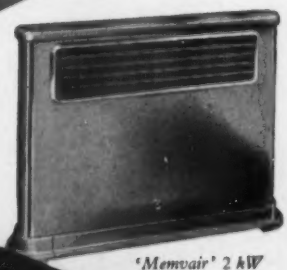
ESTD. 1912

Big sales ahead for MEM CONVECTORS

Another Autumn advertising campaign

Last season's sales exceeded planned production by the end of December — make sure you have sufficient stocks to satisfy a thoroughly Memvair-minded public.

Send for the new season's MEM Convector folder.



'Memvair' 2 kW Convector.

'Memvair' convector. ½ and 1½ kW rating.

The new 'Circulair' 1 kW Convector.

again backed by nation-wide advertising

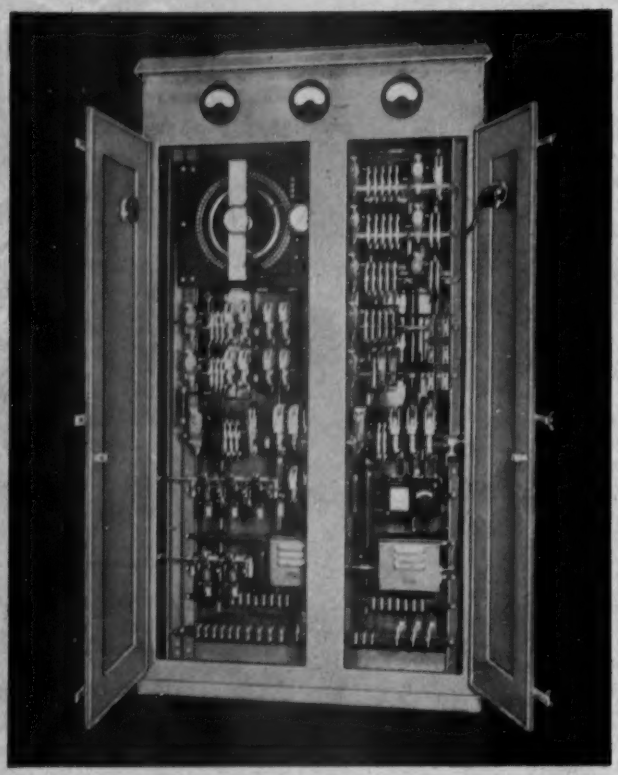
MEM

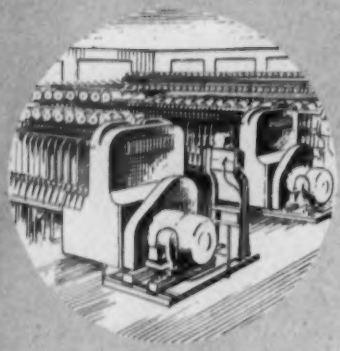
MIDLAND ELECTRIC MANUFACTURING CO. LTD., TYSELEY, BIRMINGHAM 11

Branches in London and Manchester

CONTACTOR SWITCHGEAR LTD
WOLVERHAMPTON
ENGLAND

Automatic Motor Control Gear





For Textile Plant

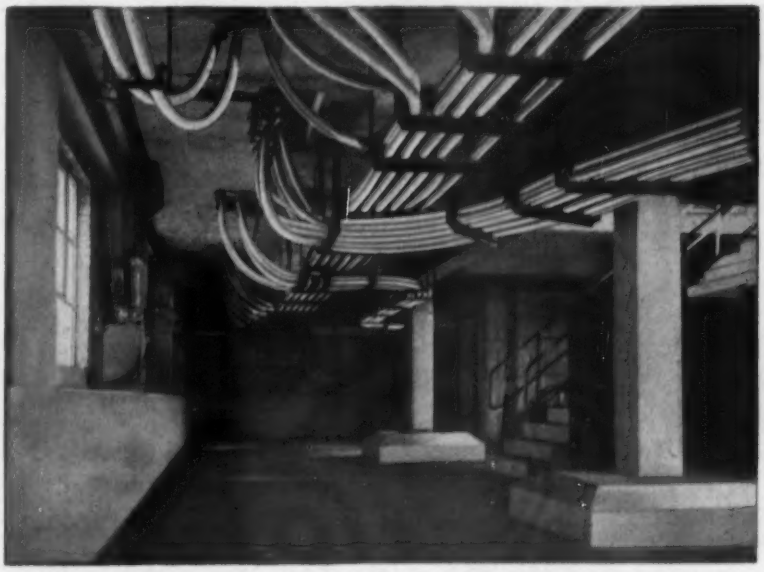
Among the varied applications of CONTACTOR SWITCHGEAR LIMITED Automatic Control Gear to special purpose equipment is included that of textile drives and an example of this is supplied by the illustration of a contactor type Ward Leonard Panel designed for that industry.

A prominent feature is the very robust construction due to the standard method adopted in mounting the components on bakelised steel bars, including a 42 H.P. direct switching A.C. Starter, generator and motor loop contactors, excitation contactor, a motor driven generator field regulator, magnetic overload protection and complete isolation.

We invite YOUR inquiries for Automatic Control Gear.

CONTACTOR SWITCHGEAR LTD
BLAKENHALL WOLVERHAMPTON ENGLAND
Telephone: Wolverhampton 25111 (5 lines) Telegrams: TACTORGEAR Wolverhampton

Cables by EDISWAN



To facilitate increased production of beet sugar at the Kidderminster and Poppleton factories of the British Sugar Corporation Ltd., a complete re-planning of the L.T. power and lighting distribution schemes was recently undertaken. This work, involving the erection and jointing of some 4,000 yards of Ediswan paper-insulated mains cable in each factory, was designed and carried out by the Cable Contracts Department of The Edison Swan Electric Co. Ltd., in association with the Corporation's engineers.

THE EDISON SWAN ELECTRIC COMPANY LTD., 155 Charing Cross Rd., London, W.C.2

Member of the A.E.I. Group of Companies

C.88

Build it with UNISTRUT

WITH UNISTRUT AND IMAGINATION YOU BUILD IT BETTER AT LOWER COST

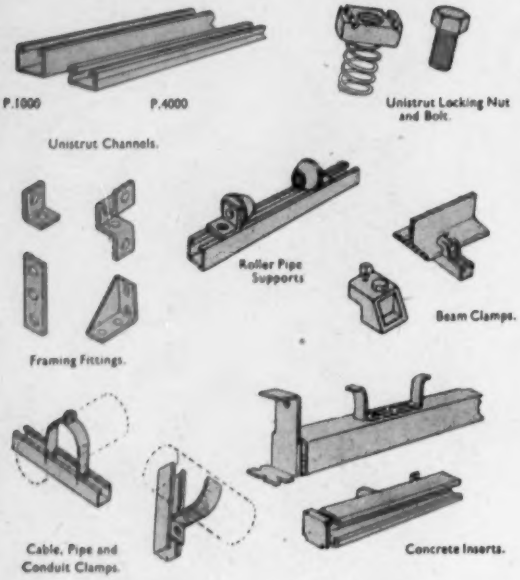
HOW TO BUILD WITH UNISTRUT
"Unistrut" Channel with continuous slot.
Wedge shaped inturned edges to take serrated grooves of "Unistrut" Nut.
"Unistrut" Locking Nut with serrated grooves.
Serrated grooves "bite into" inturned edges of Channel for positive location.
Insert Locking Nut anywhere along continuous slot of channel.
Rounded edges of nut permit easy insertion. Spring (your third hand) holds nut snugly in place for bolting.
Assemble fitting. Nut and Bolt - a turn of the spanner, it's done.

Heavy duty bar stock rack, P1000 construction. Instantly adjustable and re-usable.

Time Card installation. Neat appearance, rigid construction. With Unistrut the fluorescent lighting problem is solved too !

Unistrut concrete inserts, Pipe clamps and metal framing in tunnel piping installation.

Typical UNISTRUT fittings



UNISTRUT— the new answer to old problems, frame, rack, suspend, support all electrical and mechanical equipment, the quicker and easier Unistrut way. It's cheaper, too.

ALL - PURPOSE METAL FRAMING

UNISTRUT

UNISTRUT Division of
Sankey-Sheldon LTD.
Dept. (U2/ET4) 46 CANNON STREET
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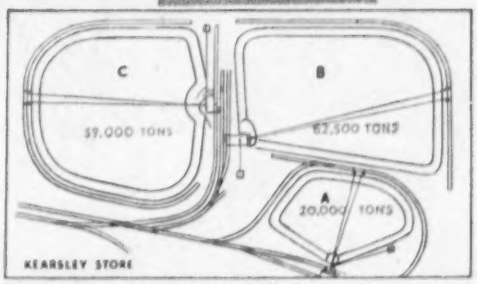
Storage Problem Solved — at Kearsley

...with Beaumont Drag Scrapers

The areas available for coal storage at Kearsley Power Station are of irregular shape, as at so many other stations, but with the Beaumont Drag Scraper system they are used to the fullest advantage. Two Beaumont Drag Scrapers were installed initially for areas A and B, aggregating 82,500 tons of coal. Each plant is under the direct control of only one man.

Further extensions at Kearsley call for a still greater stocking area, and Beaumont Drag Scraper equipment has again been specified.

Write now for further details of Beaumont equipment



Beaumont Drag Scrapers are suitable for any shape or size of storage area. Maintenance and running costs are low. The simplicity of the system permits unskilled labour to be used.

IC

ENTERPRISING ENGINEERING

INTERNATIONAL COMBUSTION PRODUCTS LIMITED

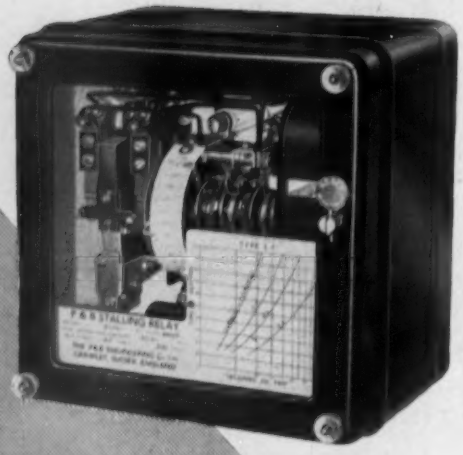
LONDON OFFICE: NINETEEN WOBURN PLACE, W.C.1 · WORKS: DERBY, ENGLAND; PORT ELIZABETH, SOUTH AFRICA; SYDNEY, AUSTRALIA

PROTECT YOUR MOTORS against Stalling

Announcing –

The new P & B Stalling Relay, the latest product of the Makers of P & B-Golds Relays giving complete protection against stalling under all conditions. The relay incorporates a dead beat thermal timing element and lock-out feature allowing one only attempted restart.

Send for descriptive Pamphlet.



THE P & B ENGINEERING CO · LTD
CROMPTON WAY CRAWLEY SUSSEX
TELEPHONE: CRAWLEY 1004

Once only!

Here is your opportunity to join the technical staff of one of the world's largest and most progressive engineering companies. METROVICK require men with suitable electrical or mechanical engineering training to work on the design, development and production of electrical and electronic equipment. There are also opportunities for Physicists, Mathematicians, and men with practical laboratory experience. Specialised training will be given in certain cases.

These are the qualifications required

FOR SENIOR POSTS An appropriate degree or Higher National Certificate.

FOR JUNIOR POSTS Ordinary National Certificate.

Your next step

Write for an application form, marking the envelope (Serial No. TS.4), to

THE PERSONNEL MANAGER,
METROPOLITAN-VICKERS ELECTRICAL CO. LTD.,
TRAFFORD PARK, MANCHESTER 17

or call at the Personnel Department

METROPOLITAN-VICKERS
ELECTRICAL CO. LTD. · TRAFFORD PARK · MANCHESTER 17

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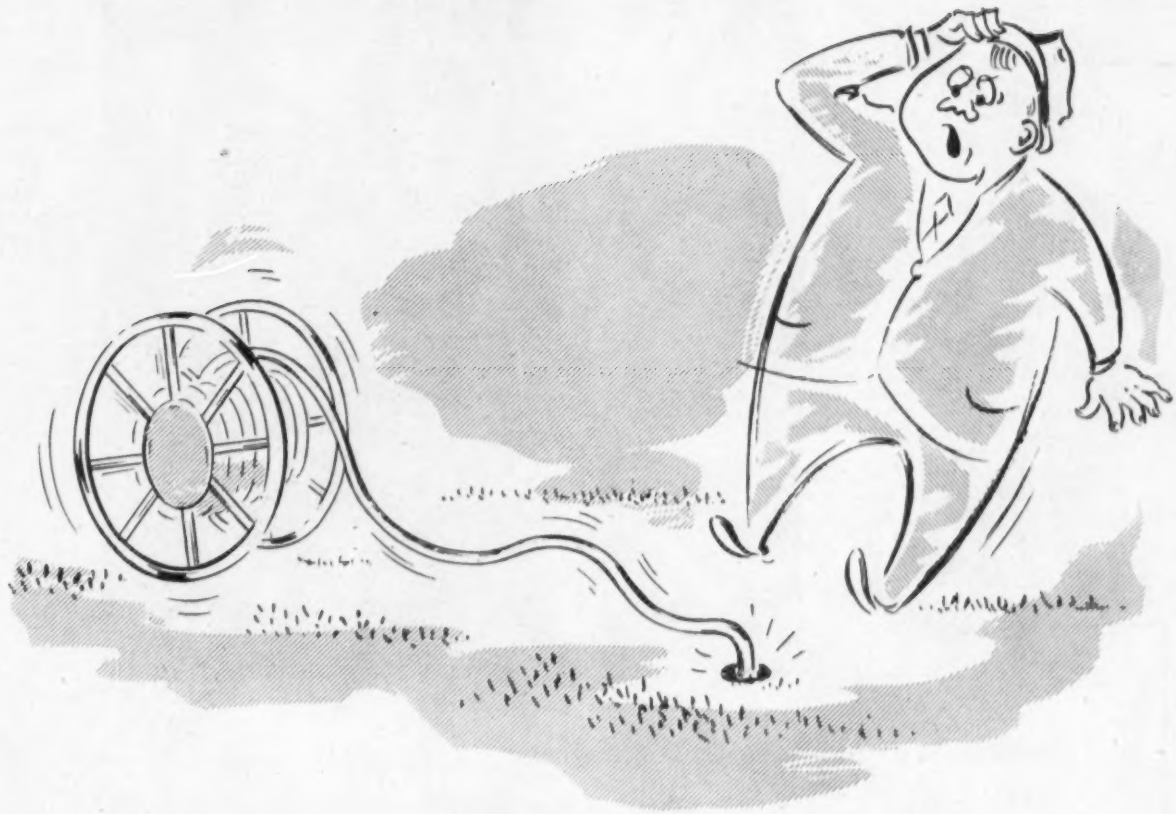

... but there are no mysterious reasons for J.&P. Cables going underground ...

it is just that engineers know they'll give good service.

Johnson & Phillips Ltd., Charlton, S.E.7

Bold and Clear

Immediate deliveries are offered for:

'ENGLISH ELECTRIC' switchboard and panel type ammeters and voltmeters with round or square cases in 4-inch, 6-inch and 8-inch nominal sizes.

- Bold open scale and bar pointer ensure clear readings at greater distances.
- Robust compact construction.
- High shock resistance.
- Low power consumption.
- Simplified mounting.
- Sustained accuracy under adverse operating conditions.
- Comply with British Standard and International specifications.

Ammeters will withstand 10 times overload momentarily without loss of accuracy.

Good deliveries are also offered for: POWER FACTOR INDICATORS · WATTMETERS VARMETERS · FREQUENCY METERS · REMOTE POSITION INDICATORS · SPEED INDICATORS SYNCHROSCOPES · REMOTE TEMPERATURE INDICATORS · SHUNTS UP TO 20,000 AMPERES

'ENGLISH ELECTRIC'
indicating instruments

THE ENGLISH ELECTRIC COMPANY LIMITED, QUEENS HOUSE, KINGSWAY, LONDON, W.C.2

Meter, Relay and Instrument Division, Stafford

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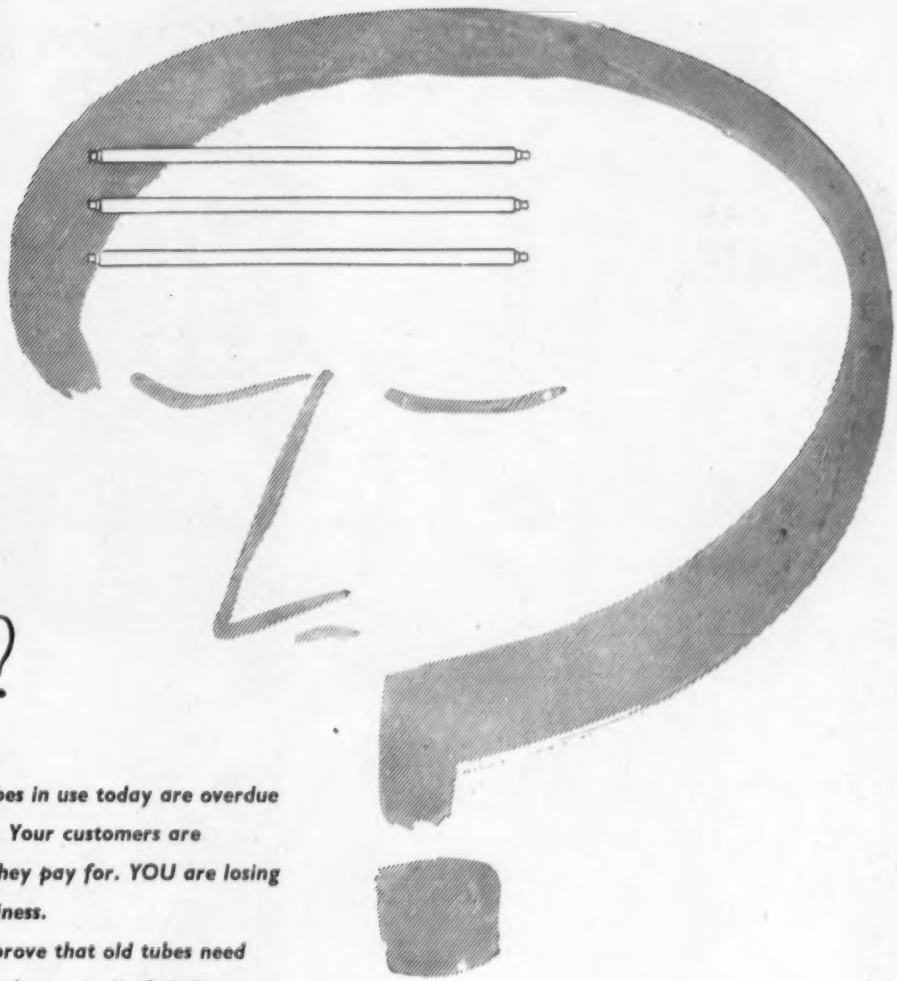

Tried the tired tube test?

Thousands of tubes in use today are overdue for replacement. Your customers are losing the light they pay for. YOU are losing replacement business.
Use this test to prove that old tubes need replacing before they actually fail. Put a few ATLAS 3,500°K 'White' Tubes into any existing installation. You'll be amazed at the difference—and so will your customer!

ATLAS 'WHITE' HAS THE WIDEST RANGE OF APPLICATIONS

Not too warm and not too cool, the colour of the Atlas 'White' Tube is ideal for all general lighting purposes. There is no more efficient tube. It has a guaranteed average effective life of 5,000 hrs. Electronic testing ensures uniformly high standards. And—what is most important to you—Atlas 'White' Tubes simplify your stock problems.

SELL MORE TUBES THIS SUMMER!

ATLAS WHITE 3,500°K

—a general purpose fluorescent tube

THORN ELECTRICAL INDUSTRIES LTD. ATLAS LIGHTING DIVISION, 233 SHAFTESBURY AVENUE, LONDON, W.C.2. Thorn

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PRICE
£6·3·8
+ £2·5·3 P.T.

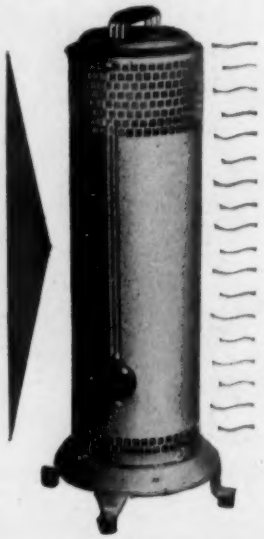
THE NEW GILLOTT Cotswold FAN HEATER

BLOWS HOT OR COLD

New—low in cost and economical to run. Safe—it is ideal for any room in the house. Used either on the floor or as a wall fitting, the 'Cotswold' heater silently fans hot air in Winter or cold air in Summer to the farthest corners of the room.

Of distinguished appearance, with neutral coloured body, deep maroon heat-resisting handle and die-cast stand.

THE MOST EFFECTIVE & ECONOMICAL FORM OF SPACE HEATING IN WINTER OR COOLING IN SUMMER



Regd. DESIGN. 874623

and the PROVED GILLOTT CONVECTOR HEATERS

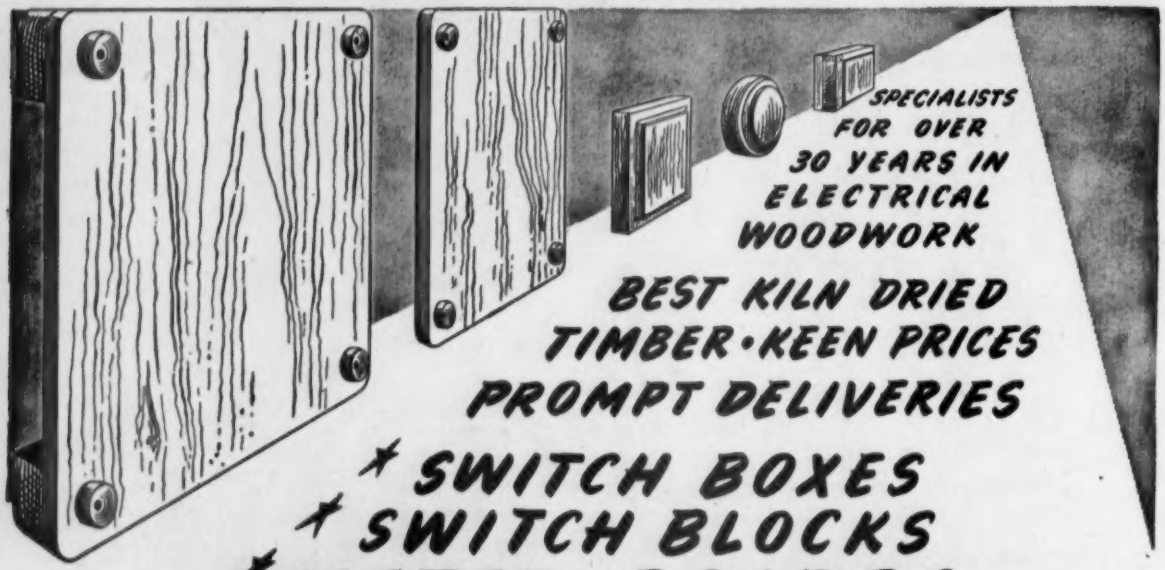
Gloucester (1½ Kw switched) & Chalford (1 Kw)

THEY'RE ECONOMICAL, LOW PRICED AND SAFE

PROVED, ECONOMICAL, unequalled value. These all-purpose Domestic Electric Space Heaters give you steady, even warmth, effectively protected to avoid waste or overheating. Safe — Portable — Heatproof — Stable. Fine appearance, attractively finished in bronze.

GLOUCESTER (1½ Kw switched 750 w) £4·0·8 + £1·9·6 P.T.
CHALFORD (1 Kw) £3·4·6 + £1·3·7 P.T.

GILLOTT ELECTRO APPLIANCES LTD.
One of the Group of Companies Associated with the Southern Areas Electric Corporation, Ltd.
COTSWOLD WORKS, CHALFORD, Nr. STROUD, GLOS.
Telephone: Brimscombe 2276/7

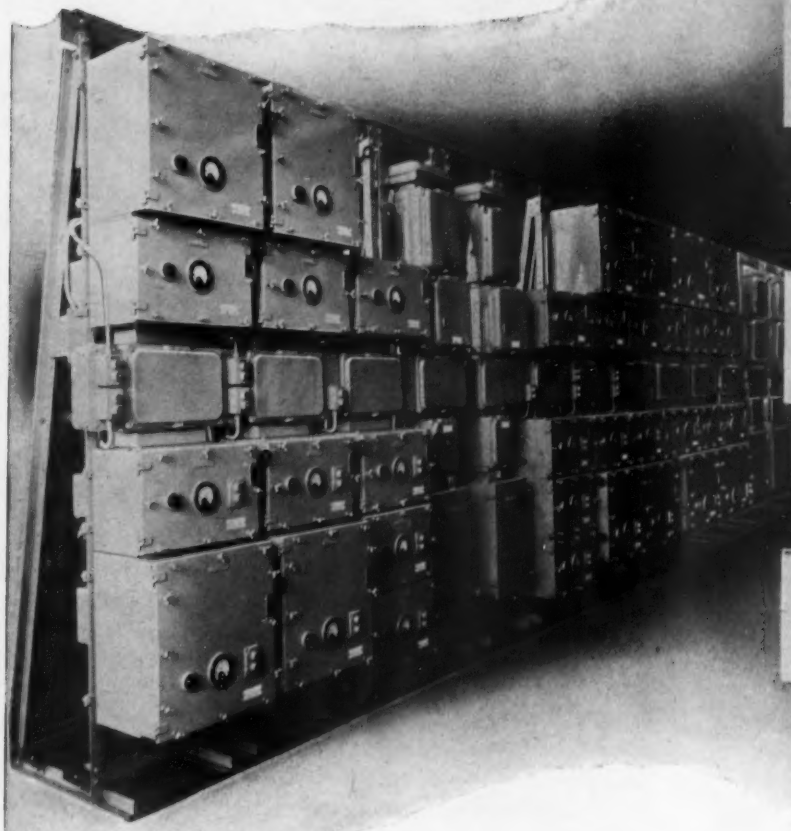


WOOTTON & CO LTD

ALMA WORKS · PONDERS END · MIDDLESEX. TELEPHONE : HOWARD 1858

'UNIBORD'

construction saves time and money



The BROOKHIRST "UNIBORD" system of motor control equipment offers these advantages:—

Space economy—tiers of busbar chambers and straight-on starters accomodated in self-supporting frames overhead ensure great saving of valuable space.

Flexibility—especially useful where factory expansion is concerned.

Interchangeability—being composed of standard units, the equipment can easily be changed about as required.

These features, combined with robustness of construction and trouble-free performance, indicate why so many factory executives specify the "UNIBORD" system of power control.

BROOKHIRST

STANDARD MOTOR CONTROL UNITS

BROOKHIRST SWITCHGEAR LTD NORTHGATE WORKS CHESTER

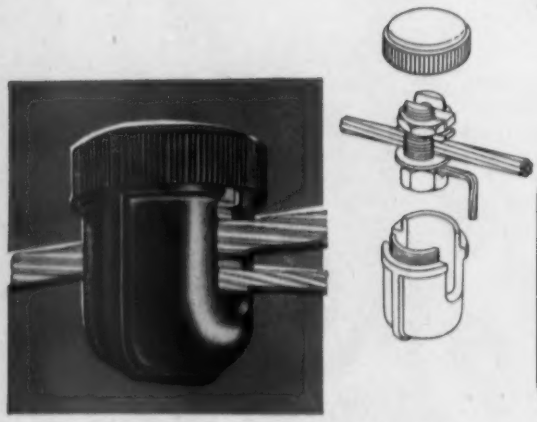
A METAL INDUSTRIES GROUP COMPANY

BS2/1/P482

"Here's the most convenient way of making Tee Connections!"

Linesmen find BICC Overhead Line Taps the quickest and most reliable method of making non-tensioned tee or service connections to overhead lines. The taps are neat and simple in design and have a minimum of components. A single nut clamps the conductors together giving efficient contact which *cannot be shaken loose by vibration.* The line conductor is not cut. Alternative taps are available in various sizes suitable for copper and aluminium conductors.

A separate washer is used for bimetallic connections and between bare aluminium conductors. A simple sealing shroud filled with BICC Weatherproof Plastic Compound gives complete protection against corrosion. Publication No. 338 gives further information on BICC Overhead Line Taps. May we send you a copy?



BICC

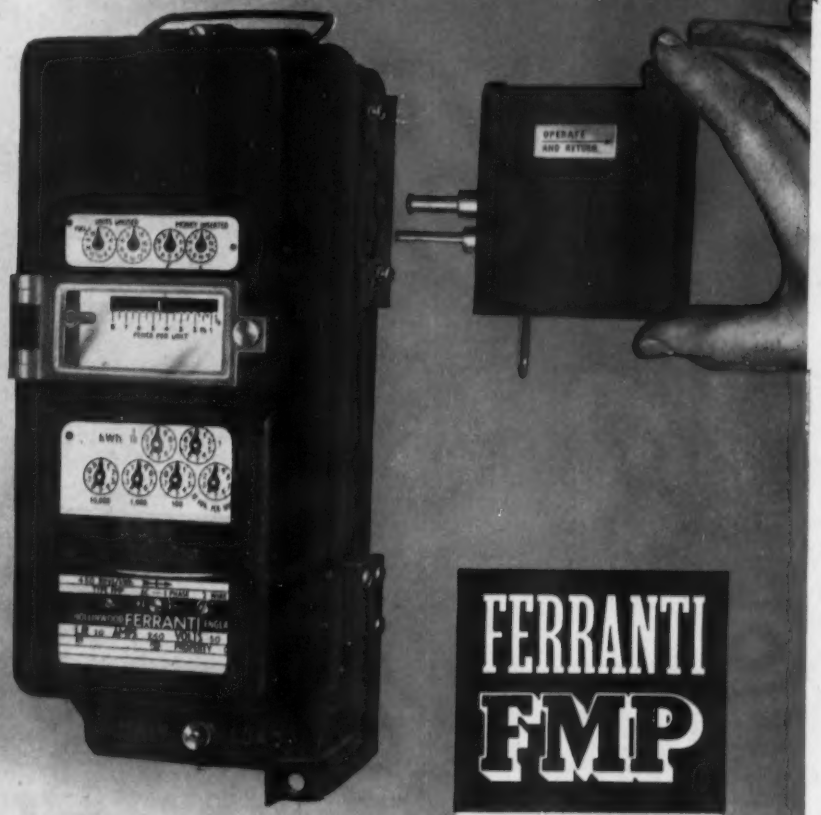
Overhead LINE TAPS

BI Callender's

BRITISH INSULATED CALLENDER'S CABLES LIMITED, 21 BLOOMSBURY STREET, LONDON, W.C.1

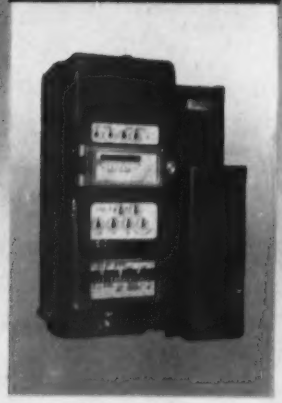
No. 6 *in a series of announcements*

Coin Mechanism readily detachable



After removing the coin box by operating a large and easy lever-latch, the coin mechanism of the Ferranti FMP Prepayment Meter is readily detachable without interfering with any other mechanism. Bent or mis-shapen coins can then be easily removed.

FERRANTI FMP



. . . and there are these further points of merit :

- Simple Price Change
- Price Change does not alter load on meter
- The Ferranti 100 amp. Micro-gap Switch
- Ease of collection
- Fixed charge collector mechanism

PREPAYMENT METER

FERRANTI LTD · HOLLINWOOD · LANCS
LONDON OFFICE · KERN HOUSE · 36 KINGSWAY WC2

FERRANTI

FM 119/2

Dependability

INSTRUMENT WIRES
STRANDS & BRAIDS

TELEPHONE & RADIO CORDS
CABLES & FLEXIBLES

LPS
ELECTRICAL CO. LTD

ALPERTON WEMBLEY MIDDLESEX
TELEPHONE PERIVALE 5621-4 TELEGRAMS ENGINEYOR PHONE LONDON

NEW DAY

MODERN ELECTRICAL ACCESSORIES

Pilot Control Switches

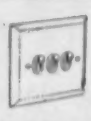
Available for flush or surface mounting with fused or unfused pilot lamp circuit. 20 amp D.P. AC main only. Brown or Ivory.

Specially recommended by leading manufacturers of immersion heaters.

FROM 16/- EACH LIST, LESS LAMP

OTHER NEW DAY ELECTRICAL ACCESSORIES INCLUDE:

FIRESIDE TRIPLE SOCKETS


TUMBLER SWITCHES

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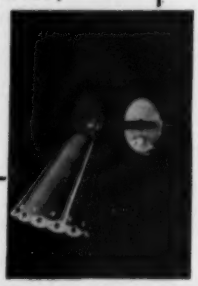

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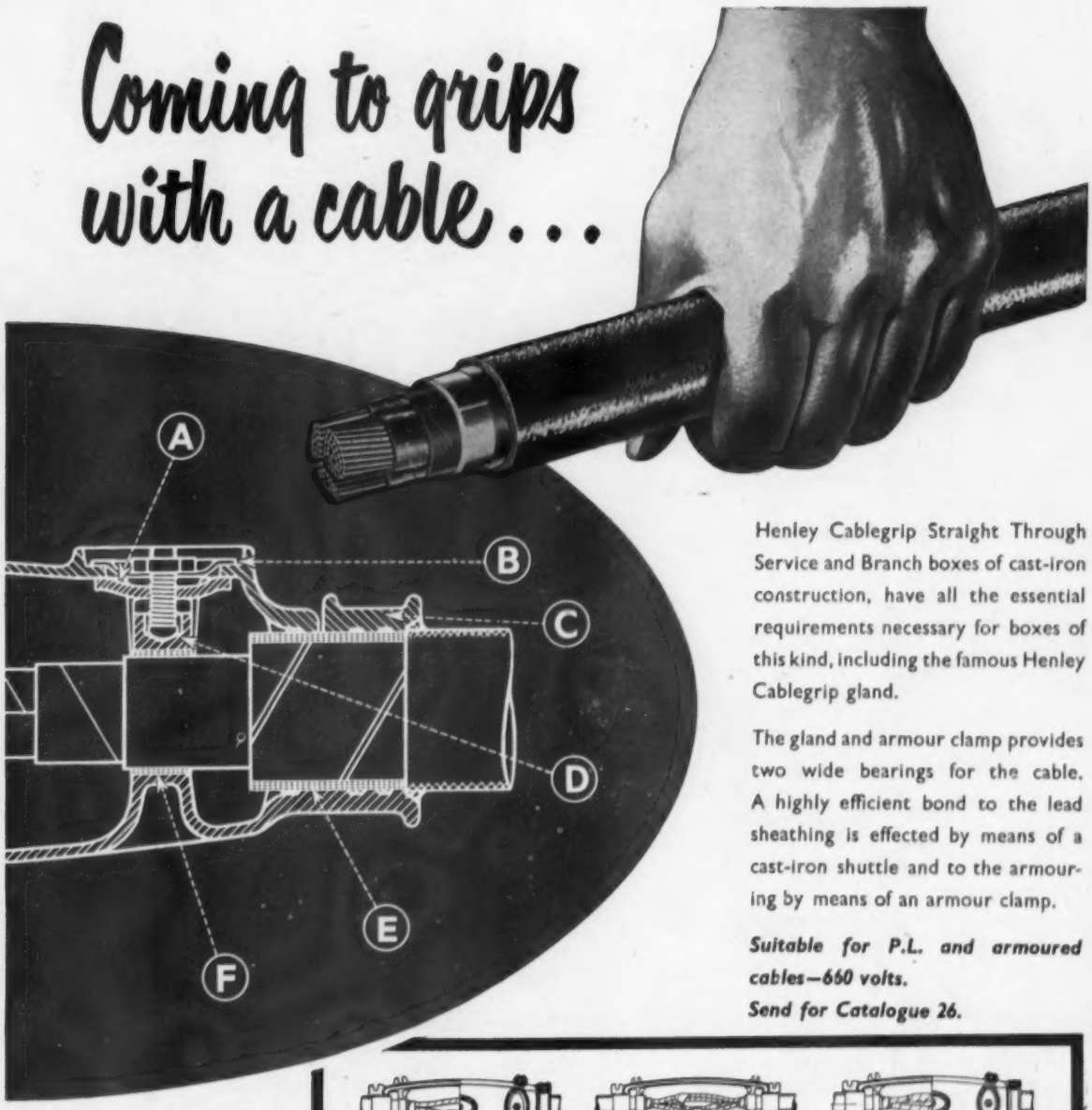

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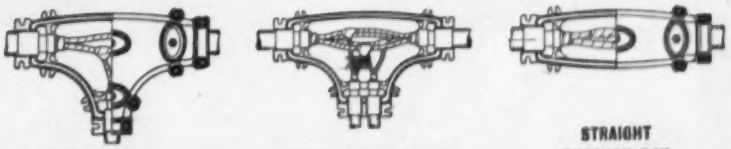

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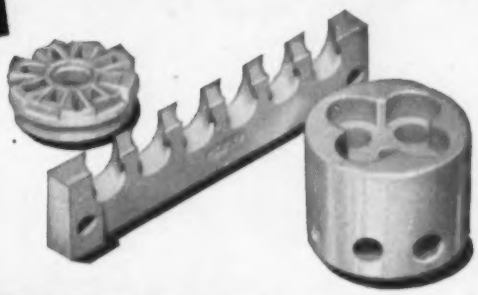

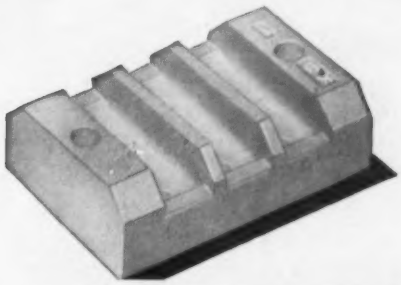

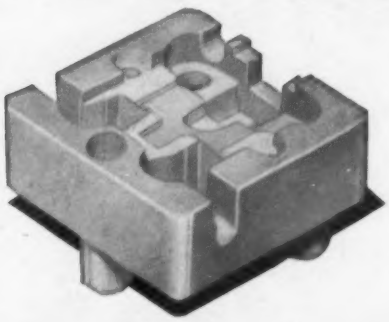

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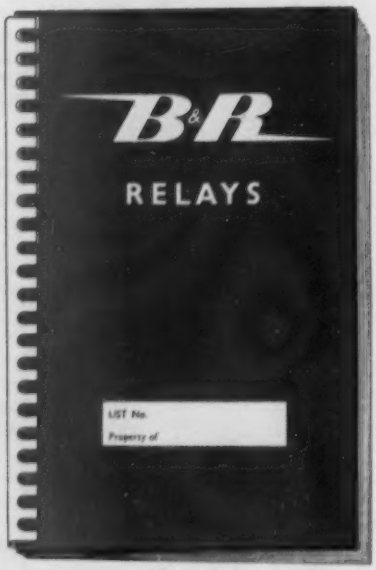

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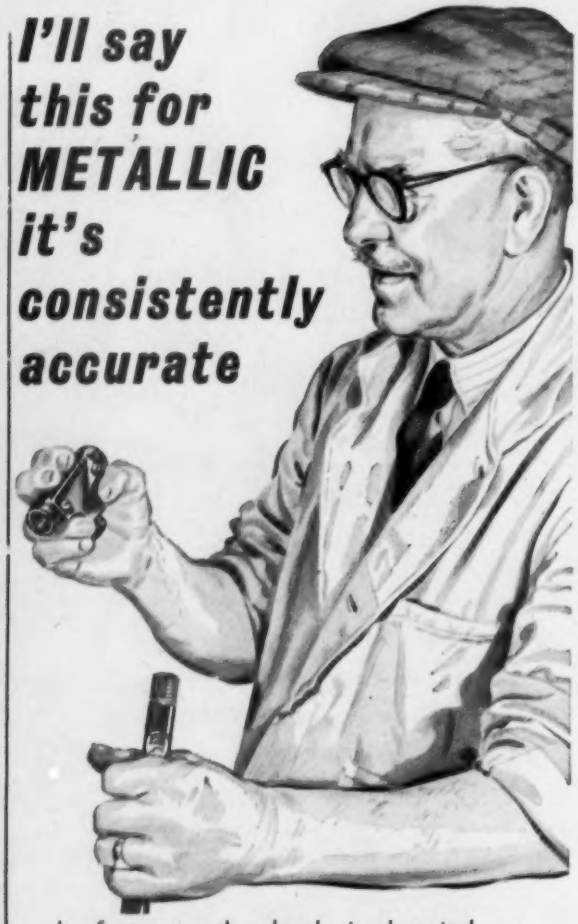

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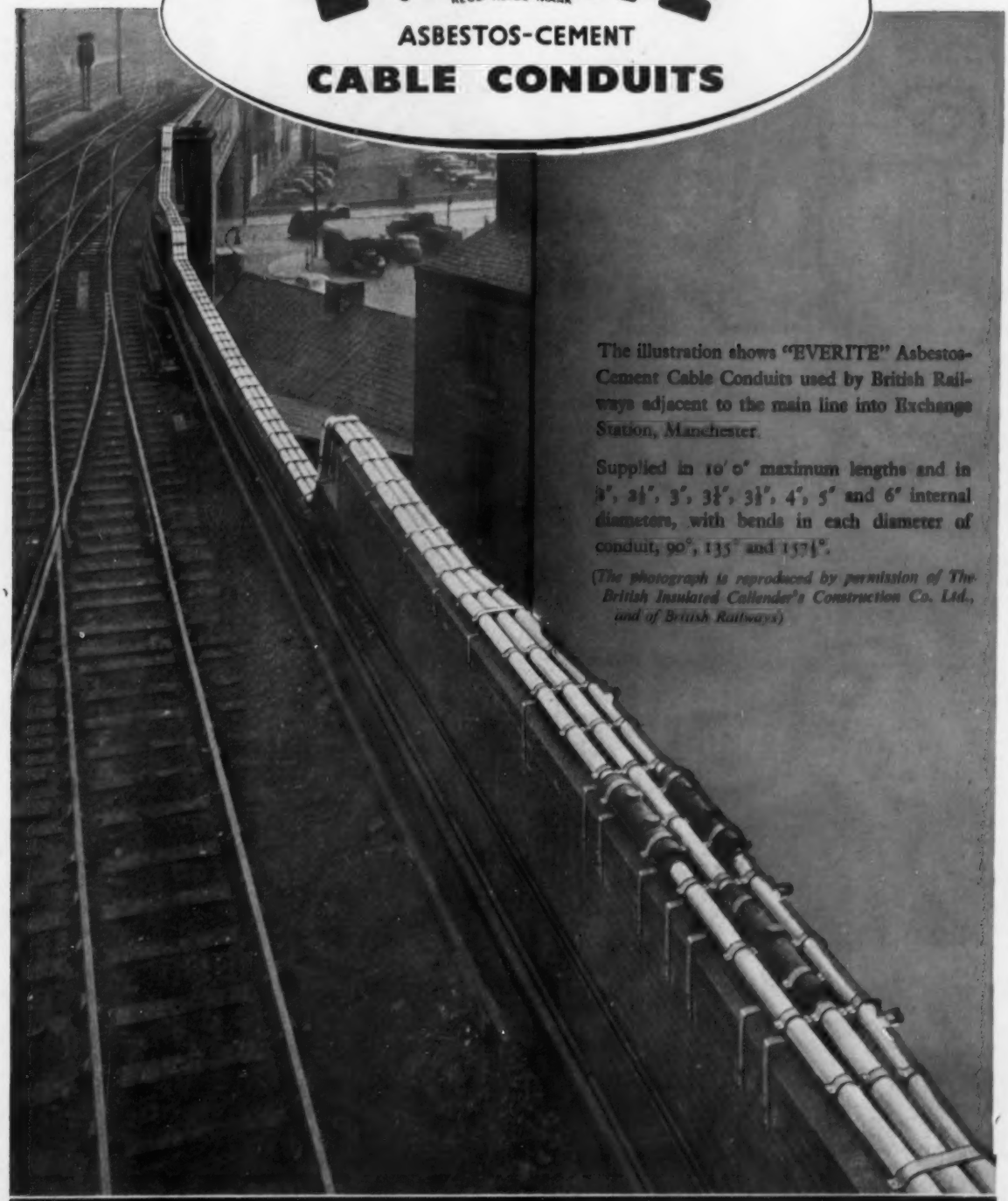

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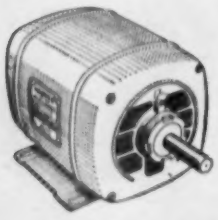

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ELECTRICAL TIMES

ESTABLISHED 1891

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D

TURNING ON THE HEAT

Some months ago we drew attention to some spectacular results of the D.S.I.R. Fuel Research Station which supported the contention we have long held that the "improved" solid fuel domestic grate is little if any more efficient than the older stool grate. Now the matter has been raised in Parliament. Mr A. M. F. Palmer, who asked the question, could hardly have hoped for an admission from the Minister that the policy of his department for the last ten years has been based on a false premise. He did, however, elicit a lukewarm response. Thermal efficiency, it was said, is only one consideration, better control and the ability to burn coke are factors that have become of increasing importance. The Minister's further statement that in some cases people have used the grates to increase the heat output rather than to save coal, reads strangely against the reported test results that the new fires are less efficient at high burning rates than the old ones. The conclusion is inescapable that the adoption of the "improved" grates, far from economising in coal, has led to an increase in its consumption. Perhaps even more far reaching is the admission that the standards of the improved fires have been raised as much as is practicable. Gone is the optimism of the Ridley committee era, with the talk of an efficiency of 40% for these fires; gone with it is the whole basis on which that committee's recommendations were based. The truth is that solid fuel for domestic purposes is becoming outdated. It lives on only with the luxury of the attraction it provides for the hearth and with the essential conservatism of the general public, a public that has been gulled into believing that they were serving the national interest and their own pockets in fitting these new grates.

DANGEROUS DECISION

In 1950, the National Advisory Council on Education for Industry and Commerce recommended that a new award should be established for students who have successfully completed a course in higher technological education. After many modifications to the original proposals, there has emerged a scheme for an independent, self-governing council awarding diplomas in technology to technical college students who successfully complete approved courses. The Council will not set examinations and courses, it will only approve them; existing technical colleges will do the teaching still, and the new diploma will encourage many of them to aim high. However, as the President of the Institution of Electrical Engineers pointed out at the annual general meeting in May, the diploma may indicate proficiency in such secondary techno-

logies as hairdressing or brewing, perhaps indistinguishably from one in subjects of greater scientific content such as engineering. A high-sounding award seems the only advantage of the plan the Minister has now adopted so it is not surprising that the Institutions have consistently opposed it. They have preferred upgrading of a relatively few technical colleges to give awards really worthy of national recognition, a course which recognises the scarcity of teachers and equipment at the level of training envisaged. Now that the decision has been taken, the question remains, how far will the institutions recognise the new award? They have it in their power greatly to offset its effectiveness by refusing to accept the diploma for the purposes of membership qualification at the high level the Minister places on it. Unless further negotiations on the results of today's debate in the House of Commons bring further modifications to this scheme, it may be their duty to make a stand along these lines.

BOILER FLEXIBILITY

Daily starting of generators has been a feature of power station operation from the earliest days, but with the growth in size of set and ever-higher operating temperatures, single and two-shift working has become one of the problems of design no less than of operation. With the present high rate of plant commissioning, sets originally designed for baseload duty are being taken off the bars at night, and with the development of nuclear generation, machines that are now being installed will eventually be relegated to part-time work. In the past few years, however, much thought has been given to the problems arising from the variation of temperatures experienced under these conditions and at the recent British Electrical Power Convention, Sir Claude Gibb spoke of the possibility of designing sets as high as 350 MW for two-shift working. One of the principal factors, which emerged from prolonged operational tests at Poole, is the importance of steam temperature control for optimum turbine starting conditions. There has been some suggestion that to this end the greater flexibility of oil firing might be used in the initial stages. Something along these lines was seen last week at Earley where an oil-fired initiator for a p.f. boiler showed its ability to add to the flexibility during the raising of pressure and for such other purposes as controlling the superheat on low loads. This is but indicative of the devices and techniques that will be developed to provide our largest units with the maximum of flexibility.

COAL COST AGAIN

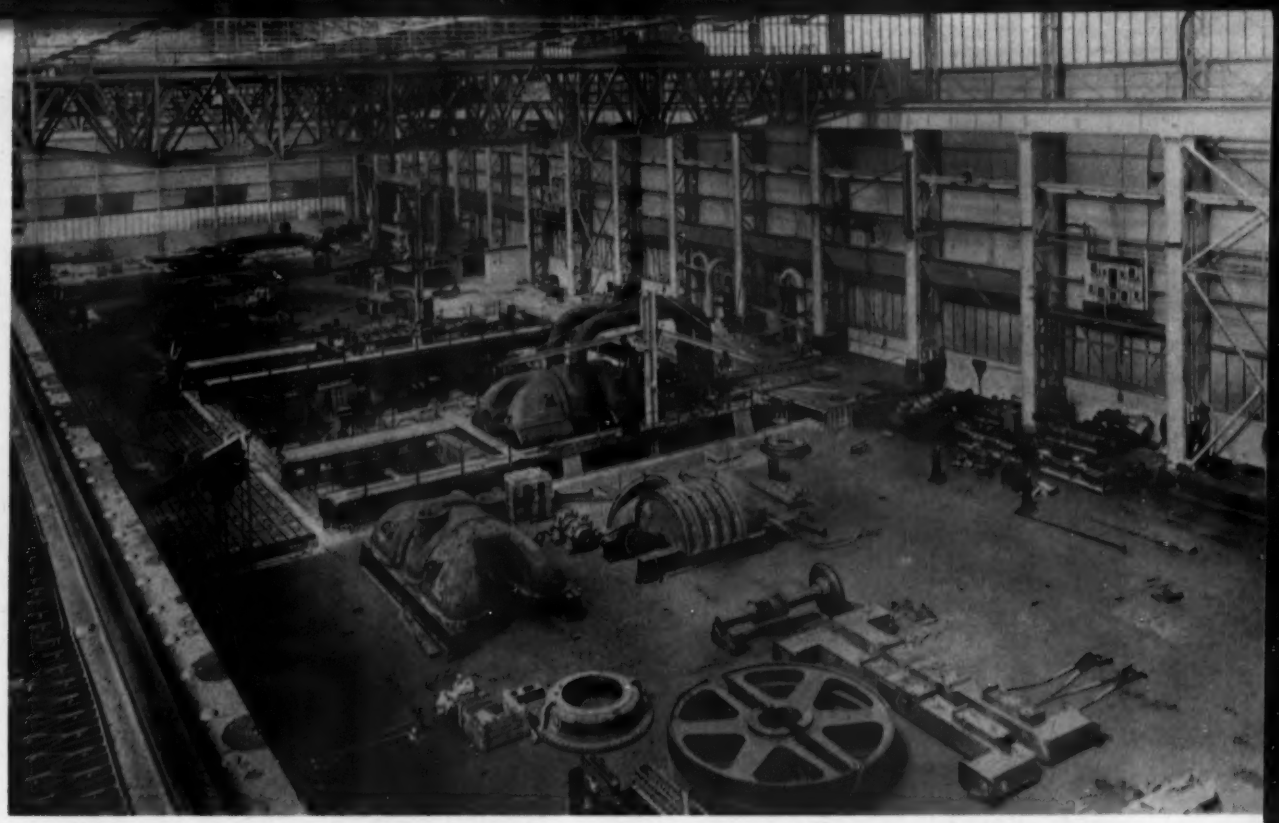
The joint announcement by the C.E.A. and area boards last Friday on the effect of the increase in coal price, added little to our own comments in last week's issue. However, several new extraneous factors have been thrown up in the week's news which have a bearing on the overall picture. Of prime importance is the statement by the chairman of the South Eastern Gas Board that in future a greater proportion of increased costs will be passed on to coke than hitherto. This is no more than the operation of economic policy to take advantage of the shortage of solid fuel and to leave greater freedom of manœuvre in the more competitive field which gas must face. While each individual gas board determines its own commercial and financial policy, any extension of this new balance of costing will indicate the severity with which electricity competition is being felt. A second factor which has arisen during the past week is the present financial position of the C.E.A. As exclusively announced in our pages last week, short-term borrowing from banks is reaching towards the exceptional high level of £180m. It would seem that a capital issue of electricity stock of something up to a maximum of £200m will follow reasonably closely on last week's £100m for the gas industry. With an interest rate of between 4 and 4½% this will raise the average rate on the whole of C.E.A. stock. Thus capital charges on new plant continue to mount; but with the rise in coal prices the premium on high efficiency plant moves ever upwards.

STANDARD PLUGS BY EDICT

Canada tackles standardisation differently from Britain and it will be interesting to review in a few years' time the progress made with a new plug there. This work has followed from a ruling of the Canadian Standards Association, that from 1st September next, portable apparatus installed in "earthy" surroundings must be provided with a three-pin plug for earthing purposes. That is, of course, the existing situation under I.E.E. rules in this country—but in Canada matters are taken further. The Hydro-Electric Power Commission of Ontario has backed up this ruling "in order that householders will not be unduly inconvenienced," with a requirement that all new *or re-wired* homes should have at least one socket-outlet of the three-pin type in each room where such appliances may be used.

BATTERIES FOR BRANCH LINES

Branch-line railway working cannot be made to pay with steam locomotives, nor is the full-scale electrification which can bring such economies on heavily loaded suburban lines appropriate. The usual solution adopted by the British Transport Commission is the introduction of light diesel services, unless the extreme step of closing the line is decided on. But there is another possibility where cheap electrical energy is available. Reports from Germany have suggested that a battery-electric rail car may be operated with advantage on such services, its practicability being enhanced by the increasing use made of light alloys in railway coach-building. The German design gives a range of 280 miles at one charge, and a maximum speed of 56 m.p.h. In a short debate in the House of Commons last week when the use of such rail cars was urged, the Parliamentary Secretary to the Ministry of Transport put the economy level for such vehicles as compared with lightweight diesel cars at ¾d./unit; on the face of it, a not impossible figure when hydro-based electricity is available as in Scotland. The Parliamentary Secretary quoted a prospective cost of 2·1d./unit, which has brought an immediate statement from Mr Tom Johnston to the surprising effect that the North of Scotland Board has in fact never been approached for a price. The sorry muddle so revealed may yet have a satisfactory ending, provided the Transport Commission proceeds with the provisional offer announced in the House to experiment with this promising form of traction.



G.E.C. Expand at Erith

New Heavy Turbine Shop Provides for 400 MW Machines

WITH the suggestion of 300-350 MW as the ultimate size of turbo-alternator plant in this country, made so recently ago as the British Electrical Power Convention, the opening of the General Electric Co.'s new heavy turbine shop at their Fraser and Chalmer Engineering Works, Erith, Kent, was appropriate in that it provides facilities for building machines up to 400 MW. In this sense, the new shop reflects the current trend towards the use of turbo-alternator sets of higher individual capacity, whilst increasing substantially the manufacturing capacity of the works.

Work on the shop began over two years ago, February 1953 seeing the start of excavations. Its erection involved the realignment of nearly four miles of railway sidings and the diversion of a considerable number of services running beneath the site. A difficulty was encountered during the excavation for the condenser pit, it being necessary to build a pump house integral with a reinforced concrete well 20 ft below ground level to drain water from a chalk layer.

Essentially, the shop comprises a single bay, with an annexe on one side housing most of the machine tools associated with the work. It is a steel framed building, the main bay extending 364 ft in length and 131 ft in width, and the annexe 284 ft by 40 ft. In the main bay the height to the eaves is 59 ft, and in the annexe, 37 ft, whilst the apex of the main bay rises to 82 ft above the floor. To 13 ft above ground level, the shop is cladded with brick, protected metal sheeting lined with plasterboard being employed for the remainder.

Illustrated above is the interior of the G.E.C.'s new heavy turbine shop at their Fraser and Chalmers Works at Erith, showing the 11,215 h.p. turbo-blower under erection

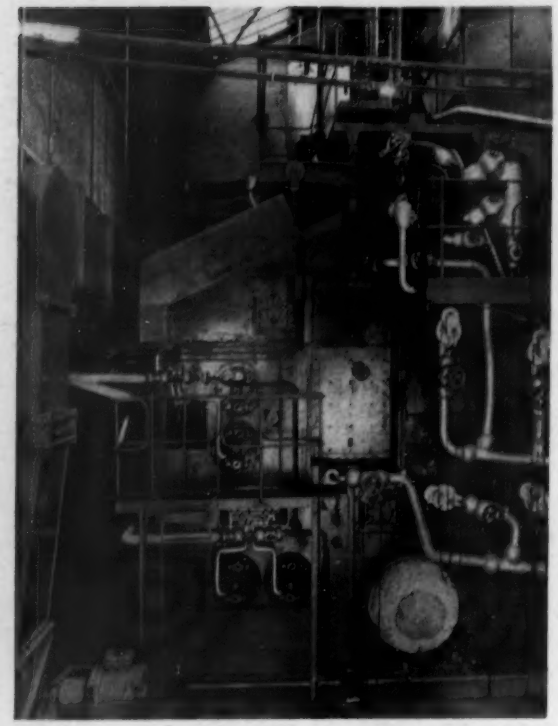
Not only does the new shop provide facilities for erecting and testing turbines up to 400 MW, but it is also designed to permit the simultaneous erection of three machines of any of the sizes now current or planned. To this end the turbine pit is specially arranged to cater for machines of different sizes and uses. Having dimensions of 91 ft long by 87 ft wide at the top, and a depth of 13 ft 1 in., the pit is of reinforced concrete and has a bed fitted with tee-slotted plates to provide considerable flexibility in the positioning of the 30 in. square stools on which the supporting columns stand.

As seen in Fig. 4, turbines themselves are erected on girders which span part of the turbine pit between its inside edge and a concrete wall running the length of the pit some 60 ft from it. Each girder, 3 ft 4 in. deep by 18 in. wide, which is made up of one 11 ft and two 17 ft lengths, is supported along its length by columns which in turn are bolted to the stools. To provide fine adjustment of level of the girders, they are actually supported through register blocks designed for packing of various depths.

Provision is made for certain tests to be carried out on turbines if necessary, the requisite boiler plant for this purpose comprising a 45 klb/hr unit of special design and supplied by International Combustion Ltd. It is a twin furnace, oil-fired type employing differential firing to provide steam at any predetermined temperature up to 875° F, at a pressure of 665 lb/sq in. Its design provides for the installation at a later date of an independently-fired boost superheater to raise the steam temperature to 1,060° F. Steam from machines under test is exhausted into a condenser supplied by Worthington-Simpson Ltd. Of 4,000

sq ft surface area and creating a designed vacuum of 28 in. of mercury, it is housed in a 17 ft deep pit adjoining the turbine pit. Other facilities include a lubricating oil system catering for up to three machines to be running simultaneously.

Fig. 1. From top to bottom below are seen a 60 MW turbine for Ince power station on the erection pit: part of the exhaust system in the pit, showing the 4 ft dia. pipes connecting with the 4 ft 6 in. main to the condenser; and the Noble and Lund boring machine cutting bearing ways in a turbine l.p. casing. In Fig 2 (right) is shown the International Combustion twin furnace boiler for the new shop



Testing of assembled turbines is designed to check balance, governing and overspeed tripping, and is normally only carried out on the initial machine of a new type, successive machines being tested only where circumstances require it. Before assembly, however, individual rotor discs are statically balanced, and subjected to a 25% overspeed test, whilst the complete rotor is dynamically balanced before being placed in the turbine casing. The completed turbine is run up to 10% overspeed on no load. Tests on the complete turbo-alternator set are, since the electrical machine is made at the Company's Witton works, normally only carried out on site, but provision is made for full-load testing of completed machines up to 3 MW in size, the electrical power being dissipated in an 11 kV water resistor adjacent to the shop.

Power Supply

Electrical power for the extensive machine tool requirements of the shop is brought in to the main h.v. switch room from the works' 2·85 kV ring main. From the board are fed two 250 kVA external transformers, providing a 415 V supply which feeds a 6-panel board for distribution throughout the shop. An additional d.c. supply is obtained from the works' main rectifying plant. The h.v. switch room also houses 127 kVA of p.f. correction capacitors.

Lighting is provided by both mercury arc and fluorescent sources, the former comprising three rows of 1 kV h.p. mercury vapour lamps in high bay fittings mounted from the roof trusses 58 ft above floor level. Fluorescent lighting comprises a row of angle type, twin lamp, louvred fittings running round all four walls of the main bay at 30 ft above floor level. In the machine tool annexe, combined fittings, housing a 400 W h.p. mercury and 750 W tungsten filament lamp, are employed.

Since the shop is fully equipped to undertake the planing, boring and drilling of large castings, and the machining of smaller parts, its machine tools installed and planned

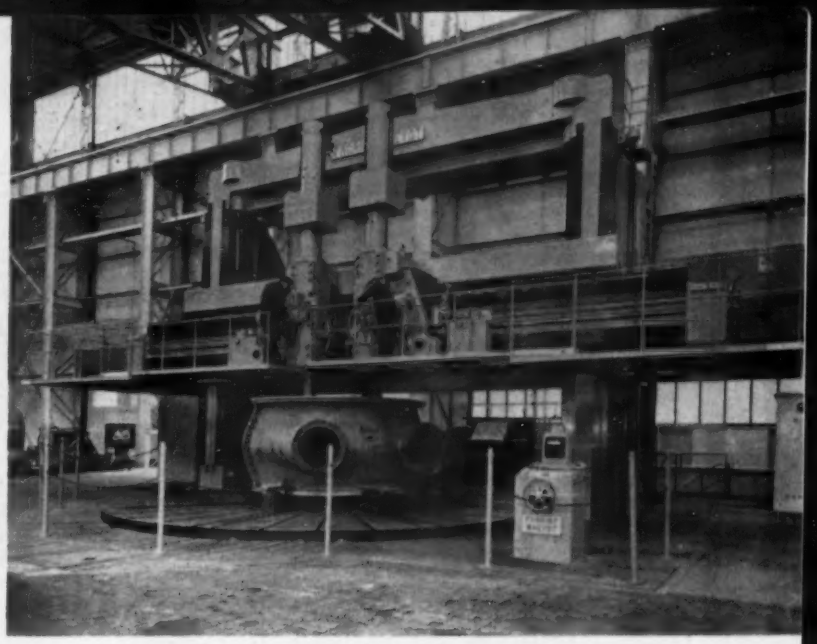


Fig. 3. The Froriep 26 ft vertical boring and turning mill in use for machining an exhaust casing. Its 25 ft 9 in. dia. table can take up to 200 tons load

are considerable. Although it is impossible in the space available to detail all the equipment in use, or for which provision has been made, one or two items are particularly notable.

Among such tools is the Froriep 26 ft vertical boring and turning mill installed for work on the largest parts such as exhaust casings. This machine, sent from Germany after the war as reparations, is powered by eight motors in all, the main drive for the table being a 173 h.p., 500 V d.c. machine, which gives a mill speed ranging from 0·2 to 6·7 r.p.m. Auxiliary motors comprise two 7½ h.p. machines for rapid traverse of the slides, and another two of the same rating for rapid traverse of the rams, together with a 33½ h.p. motor for cross rail raising and lowering, a 12½ h.p. motor for mechanical clamping of the rail and 1 h.p. oil-pump motor. All such auxiliaries are 415 V, a.c.

For boring turbine cylinders, the shop is equipped with a Noble and Lund machine taking a 12 in. boring bar. The 23 ft 9 in. by 10 ft work bedplate is 9 ft from the centre line, and the distance between steadies is 20 ft. Sixteen spindle speeds are provided by a drive from a 3 h.p. variable-speed motor through a speed-change gearbox, whilst a 20 h.p. motor provides the main drive, and 7½ h.p. auxiliaries the rapid traverse of headstock and boring steady. Later this year, a 45 ft stroke Craven planer for work on turbine cases is to be installed.

The main shop is provided with two 60-ton Wharton cranes with a span of 120 ft running on rails 43 ft above the floor. The pair may be operated in tandem to give a lift of 120 tons, whilst each has an auxiliary hoist of 20 tons.

The opening ceremony was performed by Lord Citrine, P.C., K.B.E., COMP.I.E.E., LL.D., who, after unveiling a commemorative plaque, started a 11,215 h.p. turbine on the bed for adjustment of governing valve and auxiliaries preparatory to being coupled to a 90,000 cu ft/min blower for a closed circuit air volume test. The complete blower is the first of two units being supplied for the power station at the new works of Colvilles Ltd. at Ravenscraig, Motherwell, for which three 10 MW turbo-alternators and two turbo water circulating pumps are also to be supplied. Two other turbines were also seen under construction on the bed—the sixth 60 MW machine for Uskmouth station and the fourth of five 30 MW machines due for Huncoat.

At the luncheon following the ceremony, Sir Harry Railing, D.ENG., HON.M.I.E.E., chairman and joint managing director of G.E.C., in proposing "The Guests," recalled the agreement with Professor Rateau at the turn of the century which enabled the Fraser and Chalmers Company to undertake turbine construction, pointing out that it was almost exactly 50 years ago that the first steam turbine was despatched from the works. He also pin-pointed other highlights in the works engineering history, notably the introduction of the Vortex design of blade, development of two casing designs and use of supervisory control gear. Of the future, he said that the Company were to commission 500 MW of generating plant during 1955, and that their nuclear power station development was to be based at Erith.

In reply Lord Citrine commented on the wide ranging scope of the G.E.C.'s activities in the electrical industry, and of power station plant he referred to Uskmouth, where their first generator established a record for installation, and to Ince, the first semi-outdoor station. He regarded the new shop as a vital part of industry, representing the expansion which was based on the assumption that the C.E.A.'s plans were carried out in the proper sequence envisaged. Any temporary barrier, whether financial or not, which impeded the industry, would be most unfortunate. The supply industry depended on the quality of plant to keep down price to the consumer.

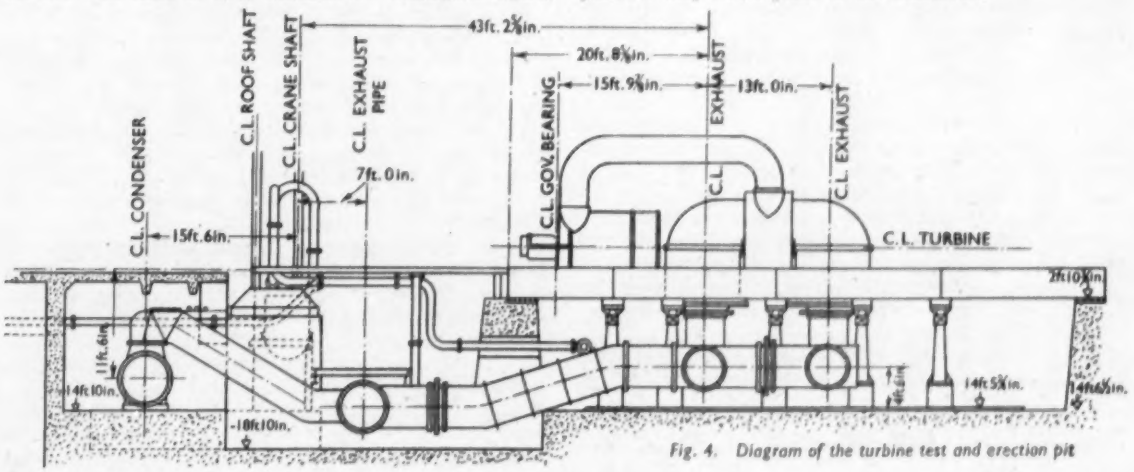


Fig. 4. Diagram of the turbine test and erection pit

The Process of Electro-Precipitation

PART II. AN INVESTIGATION INTO PHYSICAL AND ELECTRICAL DESIGN FACTORS

By D. O. HEINRICH*

IN the previous article, published in the issue of 16th June, the author developed the basic formulæ on which precipitator design can be established. In this second and concluding part, the difficulties of particle collection are considered.

Having traversed the space between discharge and receiving electrodes, the charged particles make contact with the receiving electrodes, where they give up their charge either quickly or slowly according to their resistance and the resistance of the layer of particles already deposited. They are then held to the electrodes by molecular adhesion forces.

Once a dust particle has been deposited on an electrode, it must adhere strongly enough to avoid being eroded or blown off again by the gas stream, but a greater difficulty arises when the layer of deposited dust (lacking any tendency to coagulate and flow like a liquid) grows so thick that it must be artificially removed to avoid deterioration in precipitator performance. The difficulty is to prevent the efficiency of the precipitator being seriously impaired by the re-entrainment of dislodged particles in the gas stream, a difficulty that can be appreciated by imagining dust being poured from a window at some height above ground: if there is the slightest wind, it is obvious that little if any of the dust will reach the ground directly beneath the window and that much if not all of it will be carried away in suspension for some distance. The difficulty can be dealt with in two ways:

(*a*) by allowing the dust to agglomerate into lumps large enough to fall through the gas stream without being re-dispersed;

(*b*) by guiding the dust into the collecting hopper in such a way that the gas stream has no opportunity to re-entrain the dust.

The first object is achieved by adjusting the frequency and intensity of the mechanical rapping of the electrodes to suit the conditions of each individual case. As a general rule, rapping should be as infrequent and as gentle as possible consistent with removal of the dust before it builds up enough to impair the performance of the precipitator. In dust precipitators the discharge as well as the receiving electrodes require rapping: rapping of the discharge wires is sometimes a major problem, and there have been cases in which dust has accumulated on them in sausage-like formations as much as 8 in. in diameter.

The second object has given rise to many patents in many parts of the world, the main purpose being to get the precipitated dust as soon as possible into a quiescent zone so that it can fall into the reception hopper undisturbed by the gas stream. The development of special types of receiving electrode to achieve this purpose began in the early 1920's when the problem arose of cleaning flue gases from lignite-fired boilers, the gases from which passed through an existing flue at a velocity of about 14 ft/s. Wire mesh receiving electrodes were used in the first instance, resulting in a collection efficiency of about 15%: the apparent migration velocity was 4 cm/sec, and it was observed that, although precipitation took place satisfactorily, the dust was almost com pletely re-entrained when dislodged from the electrodes It was then that R. F. Heinrich[6] invented the so-called "high-duty" electrode, of which many designs were tested, the catch-pocket type being found to be one of the most efficient: this consists in effect of a hollow box with slots pressed into the walls, the dust being driven through the slots and allowed to fall into the hopper down the inside of the box. When electrodes of this design were used the collection efficiency rose to 95% and a migration velocity of 51 cm/sec was obtained. It is interesting to note that the theoretical migration velocity calculated for the prevailing conditions and particle size distribution was 65 cm/sec, from which it is evident that re-entrainment of particles can be substantially reduced but not entirely eliminated.

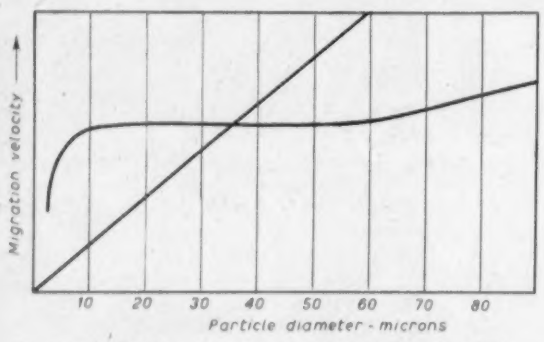


Fig. 8. Relation between partical diameter and migration velocity

Particle Size and Migration Velocity

A phenomenon which seems only to have come to light fairly recently is that migration velocity is not, in actual practice, proportional to particle size, as stated in equations (11) and (11a). At present it can only be assumed that this is due to something that happens after the particles have been precipitated, possibly the preferential re-entrainment of the larger particles, as suggested by Lowe and Lucas[4]. The curve in Fig. 8, which is based on actual test results[7], shows that small particles appear to be precipitated at a greater rate than is suggested by theory: this may possibly be due to small particles attaching themselves to larger ones or to their agglomerating among themselves into large particles.

In the intermediate range of particles between about 10 and 60 microns the migration velocity is almost constant, though it is found to rise slightly for the larger particles: this, however, is only the case when high-duty electrodes are used, as they were in the tests from which Fig. 9 was derived; the use of flat plate electrodes results in decreased migration velocity, indicated by lower collection efficiency[8]. This seems to support the theory of Lowe and Lucas that large particles are more easily re-entrained than small ones because they agglomerate less readily and firmly and are

*Mr Heinrich is with Simon-Carves Ltd. This article is based on an original address given to the Institution of Chemical Engineers (Students and Graduates Section) by the author in Manchester, Nov. 25, 1954.

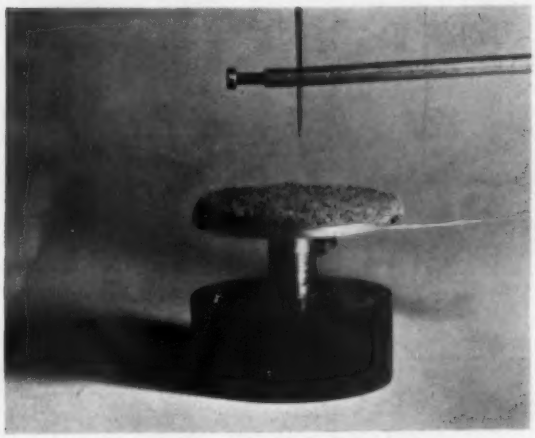


Fig. 9. Point-to-plate apparatus for investigating the phenomenon of back ionisation

held to a plate electrode by less powerful molecular forces. On the other hand the discrepancy between theory and practice is so wide that there may well be additional reasons, such as less effective charging, for the less efficient removal of large particles.

Dust Resistivity

The electrical resistivity of particles plays an extremely important part in electro-precipitation. Variations in resistivity cover the enormous range of 10^{-3} to 10^{14} ohm cm, a range which may conveniently be divided into three:

(*a*) Resistivity below about 10^4 ohm cm.
(*b*) Resistivity between 10^4 and 2×10^{10} ohm cm.
(*c*) Resistivity above 2×10^{10} ohm cm.

Particles of the very low resistivity of range (*a*) give up their charge almost instantly on reaching the electrodes, whereupon they assume the polarity of the electrode and are repelled from it into the gas stream again: the larger particles, which are not firmly held to the electrodes by molecular forces, are particularly prone to "hop" or "creep" through the precipitator, a phenomenon well known in older types of boiler flue dust precipitator when there is more than a certain percentage of highly conductive carbon in the ash.

Resistivities in the intermediate range (*b*) are the most suitable for electro-precipitation. Those in the high range (*c*) give rise to phenomena which may seriously upset precipitator performance.

High Resistivity Dust

The principal phenomenon caused by dust of high resistivity is the onset of "back discharge" or "back ionisation," in other words the creation of positive ions in the dust layer on the receiving electrodes. This is caused by electrical breakdown of the dust layer, which takes place because the highly insulating dust will not allow the particle charges to drain through it: a high potential is therefore built up on the outer layer of dust facing the discharge electrodes, and this potential may rise to a point at which electrical breakdown occurs in the gas filling the interstices between the dust particles. In this event the emission of positive ions converts a point-to-plate spark gap into a point-to-point spark gap, which is known to break down at much lower voltages, and it becomes impossible to raise the precipitator voltage high enough to give a sufficient current output. It can be seen from equations (8), (11) and (11a) that the current is proportionally related to the migration velocity and therefore controls the efficiency of particle removal: if the current is too low the efficiency will be low. It was interesting to note, in a particular plant treating high-resistivity dust, how sparking was entirely related to current input: the corona starting voltage of one section had been reduced by using electrodes of a different radius of curvature, and whereas sparking had previously been taking place at 39 kV 40 mA, after the change of electrodes it set in at 33 kV 40 mA, obviously irrespective of the voltage.

Fig. 9 shows the point-to-plate apparatus used. According to Mierdel and Seeliger[10], who have done much work on the fundamental aspects of electro-precipitation, back ionisation is related entirely to electrical stress in the interstices of dust pores which are breaking down electrically, and is not associated with points protruding from the dust layer.

The undesirable phenomenon of back ionisation can only be prevented by conditioning the dust so as to reduce its resistivity below the critical point. White[11] has done much field work in this respect and has found sulphuric acid to be one of the most effective conditioning agents; ammonia is also used in some cases. Field tests by White also indicated 2×10^{10} ohm cm as the borderline between resistivity ranges (*b*) and (*c*); resistivities of 5×10^{10} ohm cm. or more are virtually certain to cause trouble.

The difficulties caused by high-resistivity dust have been known for a long time, and in plants for cleaning blast furnace gas, for instance, they have been successfully overcome by using humidifying towers. These difficulties, however, are nowadays encountered in a severe form, and to an increasing extent, in precipitation plants for cleaning the flue gases of modern pulverised fuel fired boilers. The troubles of earlier plants for this purpose arose because the percentage of highly conductive carbon in the ash was, if anything, too high, but the opposite is now the case. In modern boiler furnaces not only is combustion substantially complete but temperatures have also increased, giving rise to highly non-conductive silica fumes: other factors controlling the con-

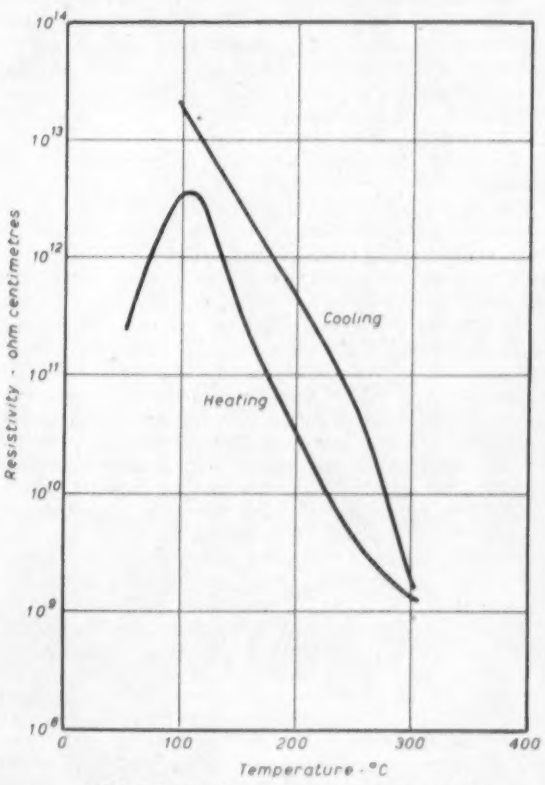


Fig. 10. Dust resistivity against temperature °C

version of SO_2 into SO_3 also have their influence, and if conversion is insufficient the strong action of the conditioning agent SO_3 is reduced.

Fig. 10 shows typical curves of dust resistivity. The lower curve shows that when the dust is heated the resistivity increases to a peak and then diminishes at higher temperatures. The rising portion of this curve is determined by the moisture absorbed in the dust surface: this moisture, possibly together with other conditioning agents, is driven off as the temperature rises, and after reaching the peak value the resistivity begins to fall owing to increasing thermal conductivity. The upper curve shows that when the dust is cooled the resistivity is high at the upper temperature range owing to loss of moisture which has not been recovered. These phenomena may be important in some cases.

Conclusion

It has been seen that there are basic equations from which certain calculations for precipitator design can be made. There are, however, secondary influences, such as the re-entrainment of particles and their electrical resistivity, which in some cases may be so pronounced as to mask entirely the physical laws relating to the ideal process of electro-precipitation: the effect of these influences on efficiency of particle removal cannot at present be expressed mathematically. There are also indications that the performance of electro-precipitators is affected by other factors not yet fully explored.

Many fundamental problems have been studied in the past, but many of equal interest remain for solution in the future. In the practical design of plant the accumulated experience of the past half-century is of primary importance.

Acknowledgment is gratefully made to the Simon-Carves Research Department for the photographs in Figs. 3–6 and the curves in Fig. 7, and to Simon-Carves Ltd. for permission to publish this paper. (*Concluded*).

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I.E.C. DECISIONS

DECISIONS reached at the 20th General Meeting of the International Electrotechnical Commission held in London recently, have now been announced. The meeting was attended by some 500 delegates representing 26 countries, including nine delegates from the U.S.S.R. Nearly 30 technical committees met. As already announced, at the meeting of the Council on 8th July, Dr P. Dunsheath was elected President of the Commission. Mr A. Roth (Switzerland) was elected Treasurer in succession to Dr Dunsheath.

Canada, France and Germany were elected to the Committee of Action, a 9-country group which acts as an executive committee between meetings of the Council. The other current members of the Committee of Action are Belgium, Italy, India, Netherlands, Norway, United Kingdom, the countries having just retired (after serving for 9 years) being Czechoslovakia, U.S.A. and U.S.S.R.

As part of the business of the meeting, five international standards were passed for publication. These include standards for domestic plugs and socket-outlets and for glass insulators for overhead lines. Standards prepared for final approval included two on unit testing of circuit-breakers, and on operation conditions for circuit-breakers.

Standards approved for circulation under the six-month rule for provisional approval include the following:

Terminal markings for power transformers and instrument transformers; markings for identification of conductors; graphical symbols for resistance, inductance, windings, capacitors, machines and transformers; classification of wiring diagrams; new types of radio valve bases; bushing insulators; rules for strength of insulation of circuit-breakers; Edison screw lampholders; metallised mica capacitors (receiver type), including a colour code; fixed carbon composition resistors; commercial hard-drawn aluminium wire for electrical conductors; aluminium alloy wire of the Al Si Mg type for overhead lines; commercial aluminium busbars; supplement to I.E.C. Publication 71, rules for co-ordination of insulation; power capacitors for use under tropical conditions; valve-type lightning arresters.

Besides organising the final stages of preparation of standards, many other subjects in an advanced stage of standardisation were discussed. These were remitted for further study by the Constituent National Committees of the Commission. Such subjects include:

Test methods for the determination of losses in rotating machinery; rules for intermittent rating of rotating machinery; ball and socket couplings for suspension insulators; rules for the rating and testing of circuit-breakers with respect to the switching of line charging and capacitor bank currents; measurement of inherent restriking voltage of circuit-breakers; rating of power circuit-breakers; co-ordination of rated voltages, rated breaking capacities and rated normal currents of circuit-breakers; dry-type (semi-conductor) rectifiers; galvanised steel wire for steel-cored conductors; series capacitors for power systems; medium-frequency power capacitors.

So far as Great Britain is concerned the minutes and related documents to be issued as a result of the meetings will be referred to the appropriate B.S.I. Committees for consideration.

As already announced, the programme of technical meetings was supplemented by numerous visits to factories and other places of technical interest.

On the purely social side a full programme was offered and, as one of the speakers said when proposing a vote of thanks, this did not only provide entertainment. The B.S.I. acted as general host and made all the arrangements, both technical and social, and provided staff and general facilities.

The General Meeting of the I.E.C. in 1956 will be in Munich, and for 1957 an invitation from Madrid has been provisionally accepted.

READERS' VIEWS

Correspondents writing under a pseudonym are asked to submit their names in confidence to the Editor

Registration in New Zealand

I WAS very interested in the articles on "Registration in Burma" (13th January), and "Wiring in Australia" (10th March), in particular with reference to registration and licensing of electricians, as this is a subject which is often discussed in England.

In New Zealand an electrician is both registered and licensed. The licence must be carried at all times whilst working and must be produced if requested by the person who is having the electrical work carried out, or the occupier of the premises where the work is being carried out, or the electrical engineer or inspector of the supply authority concerned, this latter inspector also being registered and licensed. There are different classes of registration and whilst registration can be obtained for all classes of work, an electrician registered for say "automobile" or "refrigeration" is not allowed by law to carry out contracting work and he must be assisted only by registered apprentices, improvers or students taking a recognised course in electrical engineering.

Starting as an apprentice (registered) the would-be electrician after a minimum period at the job, around 2,000 hours, and attendance at evening technical school, sits for the "Preliminary Trades Certificate" unless otherwise exempted. Having passed the first stage and meanwhile having completed a further 2,000 hours' apprenticeship and attended classes (approved of course) in theory and practice, our apprentice then sits for the Electrical Trades Certification examination in two parts, which can be taken separately. Should our friend pass this examination, he then applies for registration, to the Trades Certification Board. Eventually, when our apprentice has completed not less than 10,000 hours at the trade, he will be granted a licence and can then be turned loose in all his glory as a fully-registered wireman.

Having attained this status he may decide to aim for higher things, he may think that an inspector's job would be the thing, and must then attend classes with the ultimate object of passing the Advanced Trades Certificate examination which is a prerequisite to being appointed inspector. Whereupon, backed by the Statutory Wiring Regulations, 1935, which also give an inspector power to inspect an installation at any time and disconnect any "illegal" or, as we say in England, "unauthorised" electrical work, he may begin to feel, perhaps justifiably, that this registration and licensing is "fair dinkum."

On this question of registration, etc., I think it can be safely said that the chief arguments raised in favour of registration is that "it will raise the standard of installation and work" (Editorial comments in 13th January issue). But how many of these registration and legislation schemes make any mention of good workmanship on the lines of the I.E.E. Wiring Regulation No. 1 (General), and even the finest of wiring systems can be installed in hazardous or unsafe conditions. I'm afraid that too often these schemes eventuate into a minimum standard and contractors are happy as long as they comply with the required regulations. Whereas, under English conditions the majority of contractors are quite happy in the knowledge that their work will stand up under critical eyes, and that they have a good reputation amongst the journeymen electricians in the district.

From what I've seen of electrical work in New Zealand, it is in general, below the standard in England, both in workmanship and application. This despite statutory regulations which cover everything from private plants over 20 V 500 W, down to the point where a user of electrical energy is only allowed to switch on his lights or plug his portable appliances into the sockets. As ring main sockets have not been "discovered" out here, should some enterprising manufacturer in England interest the controlling body in New Zealand, it would be necessary to bring in legislation to amend the Wiring Regulations 1935, to allow registered wiremen to install ring main sockets at less expense and for the greater convenience and safety of his delighted customer.

To digress from the registration question, I was interested in the 10th March issue, to read about the types of switchboard used in Australia. From the article it would appear that these are similar to a type common in New Zealand, consisting of a wood box or frame with ebonite-mounting board on which are mounted individual circuit fuses, meter, and main switch, usually an isolator connected on the mains-side of the meter and unsealed, with a neutral or neutral and earth bar in the case of m.e.n. supplies. One can imagine the time and cost involved in mounting and wiring up the individual fuses on a 3-phase switchboard (usually of wood and ebonite too). Where electric cookers are installed it is common practice to supply them off a separate phase to the remainder of the house wiring, generally in t.r.s. cable, there being no regulations for medium-pressure circuits to be metalclad. Similarly, with Australian practice in regard to earth continuity, from the connection to earth to any part of the conduit, etc., a value of 2 ohms resistance shall be deemed to comply with the regulations.

To conclude, may I say that I concur with your Australian contributor in his statement that British electrical installation practice carried out in conformity with I.E.E. regulations is the safest and soundest in the world, and may I add to that, let the operative word for electrical regulations remain "shall" and not "will" or let us mediate and not legislate.

"Ex Areatopic."
NEW ZEALAND.

Battery Electric Vehicles

I HAVE just seen a note on the closing session of the Brighton Convention during which it is alleged to have been suggested that electric vehicles are not truly competitive with petrol vehicles and that the latter have a much longer life and require less maintenance.

Such a statement might very conceivably do great harm to the considerable efforts which are being made by the electric vehicle industry to encourage the use of current during off-peak periods and it is indeed most disappointing to some of us that greater use is not made of electric vehicles by electricity boards in such applications as meter service, cooker delivery, tower wagons, for which this type of transport in urban areas has proved itself to be eminently suitable.

There is, of course, no difficulty in proving that both in regard to long life and maintenance, "electrics" show considerable savings over petrol vehicles; indeed, detailed comparative figures have been published by the Electric Vehicle Association, as also by the individual makers.

As one who has been associated with the Electric Vehicle Industry throughout his working life, I can say quite categorically that the 10 to 15 years' life usually assumed in average annual running cost comparisons have always proved to be a considerable understatement because it is extremely rare for an electric vehicle to be scrapped in less than 20 years' operation. A leading London store replaced its "electrics" after they had been continuously on the road for 30 years and the replacement was effected only because of the obsolescence of the vehicles as far as appearance was concerned—mechanically and electrically they were still in first-class condition.

In the same report it was suggested that the use of electric vehicles was also limited because of their low payload capacity. It must be pointed out here that this again is incorrect since a considerable proportion of vehicles now being produced are of 30-cwt and 2-ton capacity. Vehicles of even much greater capacity can be produced within speed and range limits—indeed such vehicles are already in use in connection with public cleansing.

While admitting that the majority of electric vehicles are used for milk and bread delivery, there has been, during the last few years, an increasing demand for them for use for parcels and coal delivery, in hospital grounds, for mobile shops, etc.

H. W. Heyman,
Chairman,
ELECTRIC VEHICLE ASSOCIATION OF GT. BRITAIN LTD.

Spare Time Work

AS one who has been employed in the supply industry now for nearly twenty years I am becoming rather perturbed at the lack of loyalty shown by employees these days, mainly by those who have entered the ranks since the end of the last war. Pre-war, as a Local Authority employee, I was not permitted to engage in any other regular paid employment outside of my normal working hours. Had I done so I should have soon been handed my marching orders. And it did happen to some.

Nowadays the trend seems to be to find an extra source of regular income from evening and week-end work, and it would be interesting to learn what is the official viewpoint on this. No longer do hobbies, even paid ones, suffice. Extra regular paid employment seems to be the aim. If no official objection is raised to this extra regular paid employment (Note: "regular" and "paid"), should there be a limit to the number of hours worked outside normal working time—bearing in mind that present hours were presumably negotiated with a view to an employee having sufficient leisure to devote to rest, sport, pleasure, etc., so that he would always be fit mentally and physically during normal working hours? Further should a permanent member of the staff be permitted to run an independent full-time business, even though he only deals with this himself outside of normal working hours? (Employing outside labour during the latter.)

It does seem unfair to other employees, and a cause of weakening of possible claims for shorter hours of working, if any employee, having obtained leisure rights with the help of his Union, and presumably with the basic idea of retaining health and strength, should be permitted to abuse such rights indiscriminately. Possibly it can be pleaded that people engaged in such extra activities can do so providing they still remain fit and mentally efficient at their normal duties, but, in this case, should not some guidance be given as to what standard is to be used in judging whether normal efficiency is still present? Also, in the case of time off for sickness of such employees, is it fair that the extra burden of their duties should be thrust on fellow employees? Is it fair also that the employers should be expected to make up sick pay for these individuals who have probably overworked themselves?

Admittedly with more jobs about than workers there is every scope for the grabbers who are probably making hay while the sun shines, but shall we all reach the stage where we look to our main regular employment as just a daily task to be done until such time as we can get on with the work that is to bring in all the extras? Is there not the danger that we are apt to get to the stage where we shall even possibly be thinking of, and possibly even doing, something towards our extra jobs during normal working hours?

I am neither a keen trade unionist nor a sour grapes, but, as a small cog in a large wheel, I am keen to find out where we are heading. Quite a few of us old stick-in-the-muds are wondering: Is this preoccupation with other jobs general throughout the country, or just a peculiarity of this local section of the industry.

Full Timer.

Starting Currents

YOUR editorial comment (in the issue of 14th July) on the introduction of the new B.S. 2613 raises an important question about the appropriate tolerances on squirrel-cage induction motor starting currents.

However generous the permitted tolerances may appear it should be made quite clear that *provided that the current considered is the true starting current, i.e. the steady current taken at full voltage and with a locked rotor,* then 20% up to 100 h.p. and 15% thereafter are by no means excessive. It is a relatively easy matter to calculate with fair accuracy the "unsaturated" standstill reactance (i.e. the reactance exhibited at or about normal full-load current) of a given motor, but the prediction of the "saturated" standstill reactance (i.e. the reactance exhibited at full voltage) is much more difficult, and the assessment of the amount of "saturation" to be expected is in fact more of an art based on experience than a science based on dimensions. (The word "saturation" is here used rather loosely to describe the reduction in leakage-path permeance experienced at high currents; the causes of this reduction are only partly understood, and the reduction is certainly not susceptible to precise calculation.) It is also the case that the variations in saturated reactance exhibited by machines built to a given design are in practice much greater than the variations in the unsaturated reactance.

No reputable manufacturer is likely to abuse the tolerances by constantly supplying machines with starting currents barely less than the sum of the quoted figure and the tolerance, and in any case his business should suffer if he does. Provided therefore that these tolerances are used for the purpose for which they are presumably intended (i.e. to cover the necessarily approximate assessment of saturated reactance and the performance variations of otherwise similar machines) no serious difficulty should arise.

It should be emphasised, however, that no other starting current measurement than that already cited (namely the actual measurement of the locked-rotor current at full voltage) is in practice satisfactory; B.S. 2613 makes no recommendation on this point, and it would be interesting to know whether this omission is due to the reluctance of certain manufacturers to "face the facts" about full-voltage starting. Or can it be that this much-vexed question of high starting currents causes far less trouble in practice than is sometimes believed?

D. R. N. Seed,
CHELMSFORD, ESSEX.

SALISBURY NO. 2

Major extensions opened at Southern Rhodesia Station

IN 1940, when the final units were being installed in the No. 1 Power Station in Salisbury, S. Rhodesia, it became evident that plans would have to be prepared for additional plant to meet future demand. In September of that year, by the Council's direction, an appreciation of the position was prepared by Messrs Merz and McLellan, acting in conjunction with Messrs F. E. Kanthack and Partners. Upon the advice of these eminent engineers, it was decided to construct at the earliest possible date an entirely new plant, situated immediately to the west of the existing No. 1 Power Station. This decision has enabled the Department to take advantage of the economic benefits of larger generating units operating at higher steam pressures and temperatures. The preliminary plans provided for the development of this, the No. 2 Power Station, in three stages, the first stage to comprise two 7,500 kW turbo-alternators with two 87,500 lb/hr boilers and one cooling tower to be commissioned by 1943: the second stage to comprise two 10,000 kW turbo-alternators with three 87,500 lb/hr boilers and one cooling tower; and the final stage, two 15,000 kW turbo-alternators with three similar boilers and two cooling towers. These later extensions were to be constructed as the growth of load required.

A notable departure from standard practice was the adoption of steel reinforced concrete construction for the power station buildings, in place of the more usual brick-clad steel-framed structure. Material economies were thereby effected, and the consequent structure has justified this decision.

Orders for the plant required for the first stage of construction were placed in 1941 but, due to difficulties of obtaining plant deliveries during the war years, commissioning was deferred until 1947. A plaque, commemorating the official opening of this section of the Power Station by His Worship the then Mayor of Salisbury, was erected in the entrance hall.

The resultant delays in the installation of plant occasioned by the war, and the impetus to development afforded by the great influx of new settlers in the years following, caused demand for power to exceed capacity of the generating plant, so that considerable load shedding was necessary in the years 1950 and 1951, prior to the commissioning of the second stage. However, the position was relieved in May, 1951, by the purchase of power in bulk from the Electricity Supply Commission, following the construction of an 88 kV line from Hartley to Salisbury, as an emergency measure by this authority. At that time it was also decided to increase the capacity of the third stage to two 20 MW turbo-alternators and four 100 klb/hr boilers.

Civil Works

The power station building is of steel reinforced concrete construction, faced with Wankie blue and yellow bricks. The turbine room is 361 ft long by 59 ft wide, and the side support members carry a 40-ton crane over the length of the building. The roof is of corrugated asbestos on steel trusses. An interesting feature of the boiler-house structure is the provision of reinforced concrete coal bunkers, capable of containing 160 tons of coal above each boiler.

All coal is supplied to site by rail from the Wankie Colliery and is off-loaded from the trucks by hand into under-track hoppers. Conveyors transport the coal to or from stock and to the boiler-house bunkers at the rate of 75 tons per hour. The coal stocking area, capable of containing 20,000 tons, is served by a winch-operated drag-scraper plant.

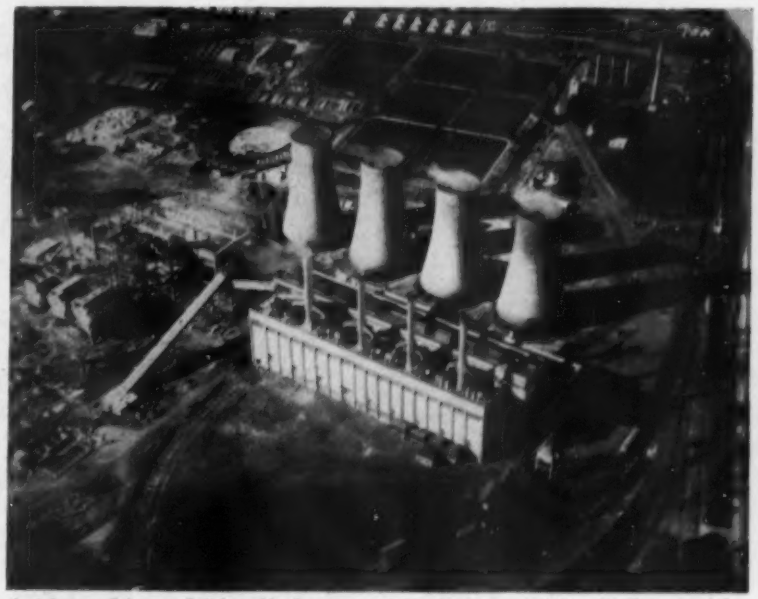
Four reinforced concrete hyperbolic cooling towers, 166 ft high and 96 ft diameter at the base, have been constructed to afford supplies of cooling water to the turbine condensing plant.

Turbo-Alternator Plant

Six turbo-alternators are installed comprising two each of machines rated at 7·5 MW, 10 MW and 20 MW maximum continuous rating. All machines are of the single-cylinder direct-coupled type, running at 3,000 r.p.m., to generate 11,000 V 3-phase current at 50 c/s. Each machine has a direct-coupled exciter and unit transformer for the supply of auxiliary power.

The condensing plant is designed to maintain an exhaust pressure of 2·4 in. of mercury at maximum continuous rating, and the associated feed-water heating plant gives a final feed temperature of 260° F under these conditions.

The 20 MW machines are over 45 ft long, and each alternator stator alone weighs over 40 tons. The ventilat-



Aerial view of the new Salisbury No. 2 station with No. 1 station top right. No. 3 station, left
(Photo: Air Survey Co. of Rhodesia Ltd.)

ing air for the alternator passes around a closed circuit in which there are coolers to extract the heat from the air.

On the instrument panels are mounted the usual gauges to measure the temperatures and pressures at various parts of the machines, together with feed water purity indicators and flow meters. The amount of oxygen in the feed-water is continuously recorded.

Upon acceptance test the largest machines were found to require 198,200 lb of steam per hr at 375 lb/sq in., and 750° F initial steam temperature, when the output was 20,000 kW at 0·8 power factor. This quantity of steam, after passing through the turbine, is condensed to water at 107° F in the condensing plant, and is then heated to 260° F by steam bled from the turbine, and raised to 580 lb/sq in. pressure by the boiler feed pumps to provide feed for the boilers. Distilled water is necessary for make-up purposes in the feed-water system, and this is provided by the unit evaporators, supplied with bled steam, on each turbine.

Boiler Plant

Nine boilers are installed in the boiler house, an in-line arrangement having been adopted. The first five units have an evaporative capacity of 87·5 klb/hr at 400 lb/sq in. pressure and 790° F steam temperature. The remaining units are somewhat larger, being capable of evaporating 110 klb/hr of water.

All units are of similar cross drum design, with water-cooled furnaces, integral self-draining superheaters, and steaming economisers. The air-heaters are of the tubular type and chain grate stokers are used.

Boiler fans are situated on the roof of the boiler house, and the steel stacks reach a height of 178 ft above ground level. Ash-handling plant comprises rotary type paddle ash extractors which deposit the ash upon a continuous belt conveyor. Ash is then lifted by an automatic skip hoist into an overhead bunker for subsequent removal by road.

Control Room

Supervision of the power station plant is centralised in the control room, containing turbo-alternator and main switchgear control panels. A mimic diagram at the top of the panels shows the operating positions of all the main 11 kV switches, and load distribution between the generators in service is effected from this position. An alarm system is installed to provide warning should fire or other dangerous conditions exist in certain critical positions throughout the station, and telephone communication is available to all parts of the building.

Facilities exist for the Salisbury station to operate in parallel with the Umniati Power Station of the Electricity Supply Commission through an 88 kV transmission line, so that each Authority can afford standby power supplies to the other under emergency conditions. The import or export of power under these conditions is metered and controlled by equipment installed in the control room.

At the back of the control panels are mounted the numerous protective relays and automatic voltage control equipment necessary for the safe operation of the plant.

Switchgear

The main 11 kV switchgear is installed in four fire-protected switch-houses situated on either side of the control room. Two of these rooms contain switchgear rated at 500 MVA rupturing capacity for the generators and main inter-connectors, whilst the switchgear required for the principal distribution feeder, rated at 250 MVA, is installed in the other two rooms.

All of these switches are of the oil-immersed metal-clad type, and are solenoid operated by direct current supplied from the power station battery, so that operation can be effected in the event of a complete power supply failure. Double busbars, with off-load selection, are provided on the generator switchgear.

TABLE 1. COSTS OF CITY OF SALISBURY NO. 2

Capacity	Cost	£ per kW Installed
Stage I 15 MW	£643,834	42·9
„ II 20 MW	£1,164,213	58·2
„ III 40 MW	£2,123,650	53·1
Approximate total cost	£3,931,697	52·4

NOTES: *Stage I includes whole cost of turbine house crane. Stage II includes whole cost of external coal handling plant. Stage III includes cost of two cooling towers; Stages I and II only one tower to each stage.*

The electric power supply for the station auxiliaries is at 380 V, and is controlled by air-break switchgear situated in various positions throughout the plant. Lighting is normally supplied from the station auxiliary system through a separate transformer, but, in the event of a failure of this supply, emergency direct current lighting from the battery is available at essential positions.

Cables

The main generator cables are of the single-core, paper-insulated lead-covered type, each conductor being of copper 1·0 sq in. in section. The 20,000 kW generators have two such cables per phase, or six cables per generator, and are racked in trefoil formation using non-magnetic clover leaf pattern clamps. The overall length of the main 11 kV cables amounts to 1,779 yards, or just over one mile.

In addition to the main cables carrying current from the generators to the switchgear, there are numerous cable circuits for auxiliary power supply, lighting, and control purposes. The total length of all such cables installed in the power station exceeds 32,000 yards, or 18 miles.

Opening

The station was officially opened by Lord Malvern, Prime Minister of the Federation of the Rhodesias and Nyasaland, on Friday last. City electrical engineer is Mr J. E. Mitchell, B.SC.(TECH.), M.I.E.E., M.I.MECH.E.

The local distribution system in Salisbury is 3-phase, 4-wire 380/220 V. Total number of consumers on the Municipality system at present is about 15,000. In 1953, output was 219·4m kWh, and the maximum load, 61·8 MW.

MAIN CONTRACTORS

Consulting Engineers	Merz and McLellan F. E. Kanthack and Partners
Boilers, Coal and Ash Handling, and Auxiliary Plant: Turbine House Crane	Babcock and Wilcox Ltd.
Cables	British Insulated Callender's Cables
Civil Works, Stage I	D. M. Campbell Ltd.
Civil Works, Stage III, and Cooling Towers	Lewis Construction Co. (Rhod.) Ltd.
Turbines, Alternators, and Auxiliary Plant	Metropolitan-Vickers Electrical Export Co., Ltd.
Transformers	C. A. Parsons and Co., Ltd.
Switchgear	A. Reyrolle and Co., Ltd.
Steam and Feed piping	Stewarts and Lloyds of Rhodesia Ltd.
Civil Works, Stage II	Trevor Construction Co., Ltd.
Low Pressure Valves	Blakeborough and Sons
Lagging of Boiler Steam and Feed Pipes	Cape Asbestos Co., Ltd.
Forced and Induced Draught Fans	Davidson and Co., Ltd.
Circulating Water and Water Extraction Pumps	Drysdale and Co., Ltd.
Low Pressure Valves	Glenfield and Kennedy Ltd.
Economisers	E. Green and Son Ltd.
High Pressure Valves	Hopkinsons Ltd.
Feed Water Pumps	Mather and Platt Ltd.
Installation of Cables and Accessories	Wilson and Herd Ltd.

around the trade

by Peregrin

I WONDER how many of us make the best use of that handy little device the light meter. Not many, I imagine, for although few of us would venture to guess the size of a room, or even its temperature, we feel quite competent to judge whether a room is well or poorly lighted, according to the ease or strain of reading a newspaper. An acquaintance of mine has a sort of passion for his light meter. He is never separated from it. Wherever he goes the meter is in his pocket. Every job he visits, every customer he interviews, out comes the magic dial. I pointed out that a light meter is not very useful in the day time, but he declared that the very fact of owning one and knowing how to use it, impresses a customer. He is probably right.

When darkness falls, however, he really lets himself go, and few people are inclined to disagree with the verdict of the meter. It is the same as being hot or cold. A man will keep comfortably warm or reasonably cool, without thinking too much about temperature, until he looks at the thermometer. Then he is horrified to find that he is enduring cold at 35 degrees or heat at 85, and immediately starts to shiver or perspire, as the case may be. In the same way a man who needs good light will believe for years that he has it, and scoff at any suggestion for improvement, until he is confronted with the light meter. Then, when he sees that he has no more than four foot-candles, half the minimum decreed by the experts, he argues no longer and usually goes to the other extreme, installing tubes all over the place, in unsuitable positions.

This particular contractor-retailer goes further. He has a miniature Lighting Bureau in his showroom, where customers can demonstrate to themselves the degrees of illumination produced by various kinds and sizes of lamp, different types of shades and reflectors, and decoration schemes. He tells me that when once he has persuaded a customer to enter this fascinating playroom, he has difficulty in getting him out again. I think he was hinting at me, for I was in no hurry to tear myself away. The lighting meter is comparatively cheap, simple to use and understand, and as there is little to go wrong with it, it has a long trouble-free life. It is surprising that all of us in the Trade do not regard one as just as much a necessity as an insulation testing set.

Rural Opportunities

Recently I was reminded how remarkably versatile electrical wholesalers can be. A firm I know well has many branches, with its headquarters in the Metropolis of the Midlands. There the atmosphere is grimly industrial. One is surrounded by a huge stock of metalclad switchgear, serried ranks of vitreous reflectors, and apparently more conduit than anyone could possibly use. All the other odds and ends of a wholesaler's bewildering variety are about the place somewhere, but little is visible that might lure the Birmingham contractor from his destiny of wiring factories and houses.

The firm has a branch at a well-known and delightful Spa, and there the general atmosphere is in keeping with its rural surroundings. The showroom looks like a corner of the Royal Show, for the accent is on horticulture and agriculture, and I was impressed by the extent of this kind of load. Even the humble greenhouse makes use of tubular heaters, convectors, and water heaters, all thermostatically controlled. Also soil heating cable, soil sterilisers and infra-red lamps.

Outside the greenhouse, in farm and dairy, the scope is immense. Innumerable appliances, some simple and others complicated, are at the service of the farmer and market gardener, and this wholesaler seemed to have one of everything on show and more in stock.

Several attractions belong to this rural business. One that always delights me is that there is no purchase tax on most of the apparatus. Another is that there is quite a bit of service work in prospect. All these electrical aids are important when in use, and a prolonged technical hitch could be a calamity, as anyone will know who has seen a milkmaid going a milking by the romantic but tedious hand method when the electric milker has failed. So the contractor must be as prepared as a boy scout. If a machine breaks down on Friday, Monday is not soon enough to attend to it, and there is no question of waiting a fortnight while a rotor or element is rewound. However, the wholesalers, the contractors and their bucolic customers seem to work together in perfect harmony, and they all look very well on it.

Infra-Red Grillers

Recently I was allowed to try one of the new infra-red grillers. I am nothing of a cook, and I had no need to be for the appliance performed its task without any skill or calculation on my part. The speed and efficiency are astonishing. In the restaurant where I first tried my hand and then watched the expert at work, chops and steaks were being grilled perfectly and swiftly, indeed in about as much time as it takes to make a piece of toast.

The remarkable feature to me was the lack of mess and fuss. I expected a cloud of steam, the unsavoury smell of burning flesh, and fat splashed all over the place, all accompanied by a discord of frying and sizzling. There is none of that unpleasantness in the hands of a skilled operator, in fact, the grilling could quite well be done on the table in sight of the expectant consumer.

For what it looks, compared with an electric cooker for instance, the appliance appears to be high priced, but time will cure that, and those who regularly enjoy its benefits soon forget what it cost. As usual, wholesalers are very much alive to this new development. They hold a good selection and stock, though at present most of the models are imported. The contractor and retailer should take advantage of these facilities. There is a wide market ahead for the infra-red griller, ready for the enterprising electrical retailer to share, and—no p.t.

Organised for Training

APPRENTICESHIPS FOR ENGINEERS AT TRAFFORD PARK

PRACTICAL training and education for entrance to the electrical industry has been the subject of continued discussion over the last few years. This was highlighted at the recent British Electrical Power Convention, where one session was devoted to the topic. Last week we were accorded the opportunity of seeing this type of work in practice, when we visited the Education Department of Metropolitan-Vickers Electrical Company. This company has been operating training schemes for graduates since 1902, and now has a comprehensive organisation operating to cover the whole range of industrial skills from craftsmanship to professional engineering.

Introducing the visit, Dr Willis Jackson, who as Director of Research and Education is in charge of the company's work in this field, paid tribute to the early efforts of Sir Arthur Fleming to establish training schemes. He stated that recent surveys indicated that in the engineering industry alone, there was a discrepancy of 30% between demand and supply of graduates in science and engineering. This was so, in spite of the fact that in 1950 the number of graduates was more than double pre-war totals—the actual ratios were 2·3 for science and 2·2 for engineering. However, since 1950 numbers have not been increasing in the way that had been hoped. The Government was making many new provisions through the University Grants Committee for greater numbers of undergraduates in science and engineering. These increased facilities were not being fully taken up.

Parallel with the work of the Universities was that of Technical Colleges. Here the picture was perhaps brighter —in 1953 the number of Higher National Certificates awarded had gone up by a factor of 3 compared with 1939. For Ordinary National Certificate the ratio was 6 or 7.

Thus the vital necessity at the moment was to attract more young men to electrical engineering. Three factors were involved, suggested Dr Jackson. First there was the total number of boys available. The bulge due to the war birth rate would give a 40% increase by 1964, but this would not be maintained thereafter. Then there was the possibility of persuading an increased proportion of boys in the 16-18 year age group to stay on at school and to study for the advanced level General Certificate of Education. Dr Jackson's personal view was that this extra time spent at school was well worth while, not only for the knowledge gained, but also for the training afforded by greater participation in the corporate life of a school. A recent report estimated that in English Secondary Grammar Schools 10,000 boys stayed on to advanced level, but a further 5,000 who could have profitably studied for this qualification were leaving, including 2,500 on the mathematics and science side. Extending this to all schools, it seemed that 4-5,000 boys are leaving school prematurely, though some of them, of course, enter the engineering industry directly.

The third necessity was to persuade a greater proportion of outstanding boys to become engineers. Statistics showed that 55% of advanced level G.C.E. students studied science, but it was doubtful if this distribution, satisfactory in itself, applied to boys with real distinction and ability.

Training at Trafford Park

At present the Education Department of Metropolitan-Vickers is responsible for training some 2,700 persons. Of these, 720 are graduates undergoing a two-year college apprenticeship. This aims at providing practical experience in the factory, backed up by experience and information gained through lectures discussions and visits from which the graduate can determine the branch of the profession best suited to his talents. The second part of the course is aimed at giving more specialised experience appropriate to the choice made.

One of the features of the company's facilities for training is a well equipped apprentice training school. All apprentices spend some time in this learning basic workshop techniques. The graduate apprentice spends two months in the school, one month on fitting shop practice, with a brief introduction to welding, brazing and sheet metal work, and one month on machine shop practice. However, the main purpose of the school is to give a sound basic instruction to craft apprentices. The school is lavishly equipped to this end, and apprentices are taken through a 7-month basic training course covering fitting, forge work, welding, sheet metal work, instrument making, machining, and armature winding. At the end of this period, the trade which the boy prefers is determined, and a 3-month intensive course is embarked on before the boy goes to manufacturing departments to get his training "on the job." A feature of Metropolitan-Vickers development of the apprentice training scheme has been the use of the experience of the Services. Half the instructors are drawn from craftsmen within the works and the other half from Warrant Officers, etc., of the Services.

This view of part of the apprentice training school illustrates the scale of equipment

Flexibility in Boiler Operation

INITIATOR FOR P.F. FIRING AIDS QUICK STARTING

OPERATION of p.f.-fired stations on two-shift working makes heavy demands on boiler operators in connection with lighting-up, and in raising boiler pressure without overheating superheater tubes. One of the outstanding attributes of the type FF1 initiator which has been developed by Fuel Firing Ltd. is that it provides automatically greater speed and greater safety in carrying out this operation.

In developing the initiator, the firm has kept in mind four features which an ideal unit should possess. These are in order:

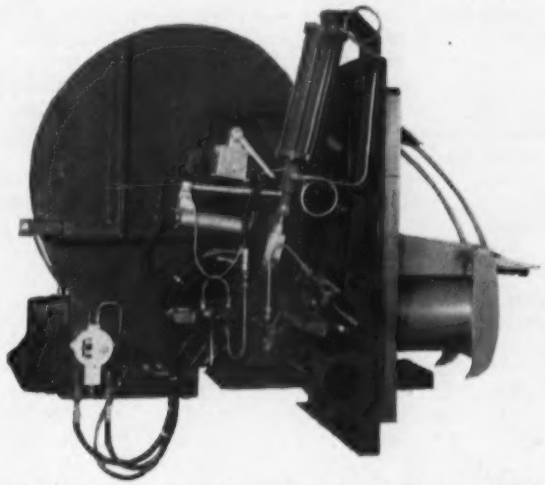
1. For low running cost, the burner should work efficiently with heavy fuel oils in a fully cooled furnace.
2. As it must operate intermittently, it must be able to be brought into action very rapidly and be fully retractable to protect itself against the effect of heat when not in use. The furnace port must be self-sealing.
3. The required rapidity of operation and the size of the boiler units call for remote operation and fully automatic control with all necessary safety features.
4. It must be reliable in operation with a minimum of maintenance or it will not come into action when it is needed. This means that it must withstand temperatures and differential expansion conditions associated with the hottest part of the furnace, where it must inevitably be located for ignition purposes.

Initiator Design

The design that has resulted is shown in the accompanying illustration. However, the heart of the initiator, the atomiser tube is not readily seen in this. To solve the difficult problem of complete ignition of fuel in a completely cold furnace, it is necessary that the oil be finely and uniformly broken up into droplets. For this reason, a gas-turbine type atomiser has been chosen. Complete combustion not only requires good atomisation, but also the admixture of all parts of the oil spray with air in the correct calculated quantity and the right velocity. The initiator ensures this by taking air from its own integral fan at high pressure, dividing it into primary, secondary and tertiary air supplies at the burner head. The primary air is used to establish stability of the flame and is sufficient to keep the atomiser cool and free from carbon under operating conditions. The secondary air is introduced round the primary air through a set of precision vanes set at the correct angle in conjunction with the oil spray to ensure correct mixing. The tertiary air is supplied through an annulus surrounding the secondary air duct to shape the flame and complete combustion. The entire burning unit is self-cooling when operating, even although the main coal burners may be on full load.

Precision combustion equipment of the type described, would certainly have its efficiency impaired if subjected, when not in use, to the radiant heat and dusty atmosphere of the furnace. The burner unit must, therefore, be completely withdrawn from the furnace when not in use and it is the means of retraction of the burner and the closing of the furnace port on which the key patent of the initiator has been granted. The method of retraction adopted is extremely simple. The entire burner assembly, including the ignitor, is built up as a unit mounted on trunnions, enabling the whole to rotate through 90 degrees about a horizontal axis actuated by a powerful pneumatic cylinder. When the burner is retracted the furnace port is closed by a self-cooling sealing plate mounted on the rotating unit; similar plates ensure that the burner closely fits this port in the operating position.

The ignitor element is contained in a housing directly above the main air tube and is protected by a hinged front door and cool air bled from the main fan ducting.



General view of initiator in operating position. The nozzle is within the air casing, right. At the rear is the integral fan

It is projected forward, when required, into the atomiser spray cone by means of a second pneumatic cylinder for the short period of time necessary for ignition and is then withdrawn behind the protective door. Ignition is secured from a low voltage system, a spring-loaded carbon rod being held in contact with a carbon disc. The ignitor element grows white hot during the few seconds for which it is in operation.

Control

Control is from push buttons set in the main boiler board. From the moment of pressing the start button, all operations are automatic. A number of safety precautions are incorporated. For instance, if no flame is established within three seconds (a photo-electric device detects the flame) a time-delay relay operates to swing the burner out of the furnace. The initiator also shuts down automatically and withdraws from the furnace if there is failure of electricity or air supply, or loss of ignition during operation.

The rapidity of action of the initiator permits its extension to give another facility. Known as combustion stability control, this incorporates twin electronic viewers scanning the hottest zone of the furnace, one being called the "monitor viewer" and the other the "lockout viewer." The "monitor" has adjustable sensitivity set to close a relay at a pre-determined furnace temperature, the closure causing the initiator which has been selected to swing into operation. This circuit is so arranged that, on selection

of any given initiator for combustion stability control, any failure whatsoever in the circuit causes the initiator to operate and thus bring about a safe condition from the point of view of explosion risk. Notwithstanding this safety measure, the "lockout" viewer on an entirely separate circuit, is set to close on a furnace which has become extinguished and this relay automatically isolates all the electric supply to the initiators, rendering them inoperable.

Observations at Earley Power Station with this control gear during a two-shift operation showed that the initiators, on average, became actuated approximately half a minute before ignition of pulverised fuel was lost. Combustion stability control does, therefore, afford a two-fold protection against failure of p.f. ignition and explosions.

Superheat Control

Some tests have already been carried out on another application for initiators, namely the control of superheat temperature at the time when boilers are being brought on to the range, so that it is possible exactly to match the turbine casing temperature with steam temperatures, without recourse to steam dumping when starting up alternators. These preliminary tests have been sufficiently successful so that the application is being installed at one of the new stations of the Authority to be commissioned later this year, for the specific purpose of superheat control.

In the case of No. 6 Boiler at Brunswick Wharf Power Station (320 klb/hr m.c.r.) four Type FF1/65 initiators were placed in the front wall of the combustion chamber adjacent to the pulverised fuel burners and four Type FF1/80 initiators, two in each side wall on a level with the top of the ash hopper. Pressure was raised from both a cold and banked condition and the boiler was floated on to the range with an evaporation of approximately 70,000 lb steam per hour at a temperature of 900° F. These tests were carried out supplying steam to the range and it is hoped to repeat these conditions when supplying steam to the turbine, on starting up, connected as a unit.

One of the remarkable points they bring out is the effectiveness of radiation from the initiator flame, since this was about 80 ft below the superheater .

Lighting Up

For the normal application, a 200 klb/hr boiler at Earley Power Station has been brought up to full pressure from cold in about 3½ hours, using oil only, and then to raise to full superheated temperature with a further half-hour of coal firing. For these tests, the Superheater Co., Ltd., installed a multi-point continuous recorder checking the temperatures of superheater elements by means of thermocouples peened into selected positions across the width of the boiler. At no time did metal temperatures rise to a dangerous range. Having raised pressure with the initiators, there is available a supply of hot air for the pulverising mills, which simplifies starting the coal firing plant and improves initial combustion. The actual procedure of bringing the boiler on to the range with this equipment is very much simplified from a manpower aspect, because it is merely necessary to start a single induced draught fan and press the appropriate initiator buttons.

These obvious operational advantages led the Southern Division Engineers to test the comparative cost of raising pressure from cold alternatively with the previous combined cost and oil technique and by means of the initiators only. The result showed a considerable saving in fuel cost alone when using two initiators by themselves and there are, in addition, further savings in the form of reduced maintenance of superheater, boiler auxiliary switchgear and feed water conservation, which it is difficult to assess on a £. s. d. basis.

Other tests carried out by the Southern Division Engineers showed that substantial savings in fuel oil consumption were possible with this equipment when used purely for ignition purposes, due to the high intensity of the flame developed, causing very rapid ignition. Ignition of the coal, in fact, takes place due to radiant heat from the initiation flame.

THE LADDER OF SUCCESS

"Look now on this picture, now on this"

(Hamlet, Act 3, Scene 3)

A CONTRAST between the day of a fourth-year engineering student and of the same individual after having achieved, through the passage of years, a fair degree of responsibility and eminence in his chosen profession.

The Student

Morning.

Lecture on Advanced Network Theory, including the theory of Regenerative Networks having more than one internal Source of E.M.F.

Second Lecture. The Electro-magnetic Field Distribution in a Resonant Cavity.

Afternoon.

Thesis on the Application of Fourier Integrals to Problems of Mechanical Vibration.

Lecture. Economics of Coal Purchasing in Power Stations of 100 MW and over.

The Senior Engineer

Morning.

Meeting to settle the typists' lunch allowance.

Long and boring interview with an office methods salesman who has skilfully evaded my secretary, and whose only real interest seems to be the prospects of Aston Villa.

The above interspersed with telephone calls (*a*) why three drums of cable, ordered months ago, have not been delivered, only to discover that they have been lost on the railway, (*b*) Would I be willing to preside (for nothing) at a meeting in the town on technical education and (*c*) if I had the address of an obscure junior employee who had left us five years ago.

Afternoon.

A walk round the works, to discover a furnaceman with his eye alertly glued to a thermometer dial which a single glance showed had stuck, a gangway well and truly blocked with a load of motor carcases, and a party of visitors who had lost their guide and were staring aimlessly at a cable extrusion machine.

Having sorted out the above, and also settled a long and bad-tempered argument between the railway vanman and the firm's storekeeper about unloading in the lunch-hour, return to the office to relax, only to find the telephone ringing. The golf secretary. Can I possibly play off my heat in the competition tonight instead of the weekend? A great help if you can, old boy, the chap you are drawn against is a real man-eater, and you are bound to be out, so may as well get it over, he adds, cheerfully.

A curious profession, indeed!

Fenscafe.

INDUSTRIAL MAINTENANCE

PAPER WORK PAYS

Systems of Forms help Maintenance Department Efficiency

FEW maintenance engineers like paper work. Filling-in forms is easily seen as a time-wasting occupation, contributing nothing to keeping plant running and repairing breakdowns. The result is, that in many smaller firms, the electrical maintenance department runs with little more in the way of records than the engineer's personal logbook, and the orders and invoices of the buying department. Yet larger firms find it worth while to embark on quite complex schemes of plant records. Why?

Paper work can save breakdowns. That is the lesson that experience has taught many engineers. At the lowest, a reminder sheet of when inspection of a particular item of plant is due, combined with a note of the results of inspection and of any work carried out, is essential to any scheme that aims to go beyond mere break-down maintenance. If the records are *used*—analysed from time to time, and discussed—they can themselves direct the way to better practices and wiser buying.

Yet the instinct of the maintenance man is not entirely wrong. Paper work can too easily multiply, once a scheme has been started. The maintenance department must ensure that no record is kept for its own sake: all records should be properly used, as an integral part of the maintenance scheme. If this criterion is applied severely, then electricians and fitters in the maintenance department will respect and use the records in a way they never will "paper work" whose purpose they cannot see.

Card Index

Probably the card index is the best basis for maintenance records, though book-based schemes have obvious advantages in terms of compactness and portability. Assuming a card system is decided upon, it is worth giving considerable thought to the information to be put on the cards. Usually each individual motor, starter, etc., has a factory number and a card to itself, its use at any one time (e.g., "driving motor for No. 1 Mill") being noted in some secondary record. In such cases, it is worth while putting the maximum possible information on the card, and to obtain this it is of value to have a duplicated questionnaire that can be sent to manufacturers, so that the same information is available for all makes of, say, squirrel cage motor. Such data can be of the greatest value when an obscure fault is being chased.

Minimum information on an apparatus card should be factory number, nameplate information, and notes on bearing types, overload settings and oil types. In addition, it is usual to have on the reverse of the cards a brief record of all work carried out, including the results of maintenance inspections. It is occasional analysis of this section of the records that can show up a weak design, or a starter applied to a duty for which it is unsuitable.

If the card index is likely to prove the most suitable form for the records just discussed, there is a more even choice between cards and wall charts for the other essential element of minimum maintenance records, the "reminder scheme" or "progress record." This gives the date of next inspection, and it implies that an inspection period has been determined for all items of plant, a subject outside the scope of this article. In this particular record, the fewer facts the better. Minimum identification of the item of equipment involved, together with the maintenance period is all that is required. There is scope for ingenuity in arranging cards or charts so that any maintenance work overdue stands out sharply. Probably wall charts are the most practical, though much depends on the size of organisation, and the split of responsibility between the maintenance or plant engineer and his various foremen.

American Practice

A two-part system such as described here requires but little clerical work once it has been launched—but it gives close control of maintenance and inspection and with that, the extra dividend of a compact summary of experience in the conditions of a particular factory. Yet it is only the minimum start to the help that forms can give to economical running. Authorisation forms, of the permit-to-work variety can be an important step towards better safety performance: report forms can ensure that management receives regular and succint information about the condition of plant. On this wider aspect of the system of forms that a maintenance department can build up, it is of interest to look again at the remarks of the Productivity Team on Plant Maintenance, which reviewed U.S. practice, and to some extent British, in 1952.

One of the earliest comments of this team with respect to records, is that the fear is widespread of more and more paper work in maintenance departments leading to an increase in overheads. But the team answers this by suggesting that what in fact happens is that information previously existing but scattered is made more obvious as well as more accessible and useful by being concentrated in official forms.

The team suggests that there are three forms of maintenance documentation, dealing respectively with

(*a*) Planning and preparation.
(*b*) Operation of the maintenance scheme.
(*c*) Review.

Similarly, forms themselves may have a three-way classification.

(*a*) Authorisations and schedules.
(*b*) Returns.
(*c*) Records.

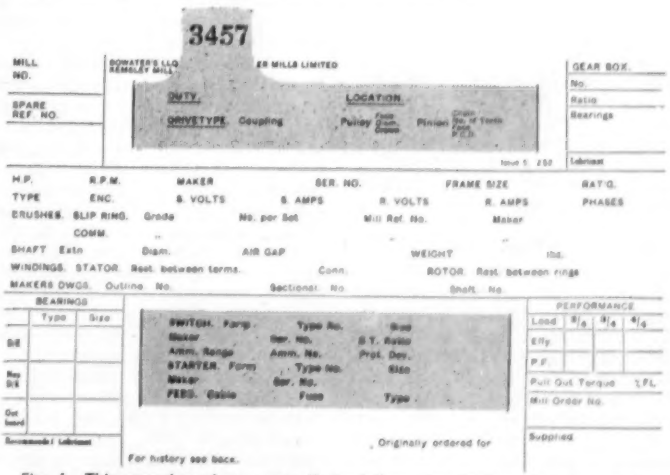


Fig. 1. This record card presents all the information likely to be required for maintenance, repair and test of a motor. Auxiliary slip-in cards (here shown shaded) add information on present duty and the associated starter

PLANT JOB CARD.

CLOCK No. | NAME

MILLWRIGHT | JOINER

ELECTRICIAN | PLANT DEPT.

TIME REPORTED | PLANT JOB No.

A.M. .....
P.M. //

Description of M/c. etc .....

M/c. No..... Section.....

Please attend to the following Repairs.....

Departmental Foreman.....

Plant Dept. Remarks .....

Plant Dept. Foreman.....
SIGNED ON COMPLETION ONLY.

Fig. 2. Costing and report requirements are combined in this form. Space for request and report is normally greater than shown. Time and costing spaces are on reverse of card

The first rule suggested is that a document should not endeavour to perform two functions into different groups, or two functions one of which is temporary and the other permanent.

Referring to the reminder chart, the team emphasise that it has the advantage of ensuring that detailed consideration is given to maintenance operation some time before the target date. There is considerable enthusiasm for the use of colour on charts, which span the year, with a line for each item of equipment. Then red and blue markings can show where inspections were missed, or showed a fault, and where action was necessary on a breakdown. Thus a chart covering a year and a particular group of, say, motors, will show the "general health" both of the installation and of the maintenance scheme. There is a recommendation that length of inspection periods should be reviewed at least yearly, but this is probably more applicable to frequently inspected mechanical plant than to electrical equipment.

Recording and Costing

Whatever record system is used, there will always tend to be some uncertainty as to whose task it is to get information recorded. The team quote as a typical workable system the following: The maintenance charge hand, who is the maintenance foreman's immediate deputy, and is responsible for allocation and control of labour, makes out a report on work done in the daily maintenance log. Items to be recorded are underlined by the foreman when he reads the log, and amplified as necessary in respect of materials or work on services outside the scope of the particular charge hand. When the log comes to the maintenance engineer, he adds any points of technical interest which he wishes to have recorded. The log is then returned to the foreman's office, and information is transferred to the appropriate records by the foreman's clerk.

Costing

In this discussion of the use of forms, no account has been taken of the costing of work. A modification of the usual time card, punched on a clock, can conveniently combine maintenance instructions and reports with the basic information for costing. The accompanying illustration shows a simple card combining a request for attention and a report on the front, with provision for time punching and costing calculations on the back.

Details of individual schemes along these and similar lines have been given in the past, and will continue to appear in the future. The form, it may be repeated, is certainly not a time-waster, and it is more than a mere time-saver. It is a maintenance tool whose use requires to be learned, but which, once established, will give a cheaper maintenance system and fewer breakdowns.

LIGHTING SIDINGS

ENGINEERS concerned with the provision of lighting for yards and rail sidings in use both day and night are now provided with a useful guide in the National Coal Board's Information Bulletin No. 55/145. Although this publication is primarily concerned with colliery installations, its subject matter is eminently suitable for similar application in other industries.

In general, lighting in sidings has to take account not only of horizontal illumination necessary to silhouette wagons against brightly lit rails, but of vertical illumination to facilitate recognition of chalk or other identification marks on their sides. Large sidings demand a higher level since the movement of wagons is likely to be faster. At changeover points, where separate wagons may have to be identified, the highest standard should be achieved. Overall, the diversity ratio of the maximum and minimum illuminations should not reasonably exceed ten to one.

For lighting areas such as railway sidings, two main systems are available—high mounted fittings, some 50 to 60 ft above ground level or low mounted fittings at about 25 ft above ground level. In some cases, particularly where a particular locality may require a higher level of illumination, a combination of the two systems may be preferred, supplementary fittings being mounted at the lower height on 50/60 ft high columns already carrying a group of fittings. This method, employing 200/500 W lamps in dispersive reflectors or refractive lanterns at the lower height, is also suitable for emergency lighting for fog conditions.

The high mounted system, which would require narrow or medium beam floodlighting projectors, or street lighting type lanterns, offers the advantage of covering the area to be illuminated with the minimum number of columns, particularly where two or more fittings are mounted on each column. The use, however, of floodlighting fittings, so mounted and sited that the beam is depressed only slightly from the horizontal, may result in glare. In such cases high wattage, cut-off reflectors or refractor lanterns may be used.

The low mounted system is most suitable on relatively small sidings, or in areas particularly liable to fog. Its use permits fittings to be sited close to working positions but the greater number of poles and fittings required results in higher installation costs. Current practice tends to favour high mounted floodlighting and/or street lighting units.

As already pointed out, floodlighting projectors make suitable fittings for high mounting but dispersive reflectors giving symmetrical distribution, or asymmetrical or axial distribution street lighting lanterns may also be used. Both filament and gas discharge lamps may be used, the former being preferred for floodlighting fittings since the compactness of the light source facilitates control of the lighting distribution. A satisfactory spacing/height ratio for the above fittings is considered to be 5 to 1.

Columns may be either of steel, concrete or timber and, on high mounted systems, should be permanently fitted with ladders to facilitate maintenance. They may be mounted round the periphery of the siding, usually at least 10 ft from the track. Distribution should be carried out with underground cable, although overhead lines, with adequate clearance, are not precluded for use with low mounted systems. The bulletin recommends illuminations between 1·0 and 2·0 lm/sq ft at fouling position in gravity yards and shunting necks in flat yards, with 0·25 to 0·5 lm/sq ft for walkways and frequented areas elsewhere, and a minimum of 0·1 lm/sq ft of yard lighting, the choice of light source is governed by economic factors, its brightness and area and spectral composition, and maintenance facilities afforded. Although both filament and gas discharge lamps can be used, the latter may be objectionable by reason of their colour, particularly if there is any possibility of confusion with adjacent railway signals.

Although the actual system adopted will depend largely on the physical structure of the yard, an arrangement of open type floodlights or other angle reflectors mounted, where possible, on adjacent buildings by means of cantilever brackets will be suitable. Mounting heights should be preferably 20 to 25 ft, and normally not less than 16 ft to give wide coverage.

Annealing Copper Tubes

FURNACES DESIGNED TO EASE MAINTENANCE OPERATION

MAINTENANCE considerations are too seldom taken into account in designing new electrical apparatus. This cannot be alleged with regard to the electrical heat annealing furnace recently installed by Yorkshire Copper Works of Leeds as part of their re-equipment and expansion programme. The furnace has been designed and installed by GWB Furnaces Ltd., of Dudley, and is designed to treat tubes from ¾ in. up to 6 in. diameter in lengths up to 28 ft. The illustration gives a general impression of the furnaces, which has an output of 30 cwt of tubes per hour at 650° C. The furnace has an electrical rating of 225 kW, arranged in three independent automatic control zones, an average output being 25 cwt per hour.

General view of annealing furnaces, control and indicating equipment at the rear

Heating Zones

Zones 1 and 2 of the furnace, where the initial heating up of the charge takes place are rated at 85 kW, and zone 3 at 55 kW. The unit is fed from the 3-phase mains supply, distributed equally across the phases and heating elements in each zone are fed through tapped transformers to give reduced ratings when working in the lower temperature ranges, and when treating relatively light charges. The transformers supplying zones 1 and 2 are fitted with taps giving 75, 65, 55 and 45 kW while the transformer supplying zone 3 is fitted with taps at 45, 35, 25 and 15 kW.

The heating chamber is 20 ft long and 3 ft 9 in. usable width, being suitable for accommodating charges up to 6 in. high. The heating zones are 5 ft long in zones 1 and 2, while zone 3 is 10 ft long. A water-jacketed cooling chamber 23 ft 6 in. long is fitted at the exit end of the heating portion of the furnace so that a gradual cooling rate of the charge is achieved, giving the desired mechanical properties to the charge.

Heating is provided in the form of heavy nickel-chromium strip fitted in the roof and hearth of the heating chamber. The heating elements in the roof are carried on nickel-chromium hooks, while those in the hearth are supported on specially moulded refractories.

All rollers throughout the installation, including the 30 ft long loading table, are power driven. Generally, all rollers are at a pitch of 1 ft except in the heating chamber itself, and otherwise where subjected to heat, in which case they are at a pitch of 6 in. in order to give maximum support to the brass tubes when at elevated temperatures. The rollers in the hot portion of the furnace are of a heat-resisting alloy, while elsewhere they are of normal mild steel. All rollers are flanged in order to locate the charge, and by a special design arrangement the flanged rollers may be extracted, when necessary, through the side of the furnace. Another design feature which considerably eases internal maintenance and enables any jams to be speedily released is the lift-off roof of the heating chamber which is removable in sections. When in position, the roof rests in a gas-tight sealing trough running round the bottom half of the furnace body. Special attention has been paid to the question of suitable bearings for the rollers, and it has been found that the most satisfactory type is of the self-aligning graphite variety. To cater for differences in the charge characteristics, the roller speed can be adjusted by means of a Carter infinitely variable hydraulic gearbox; the speed indicator is included.

Control

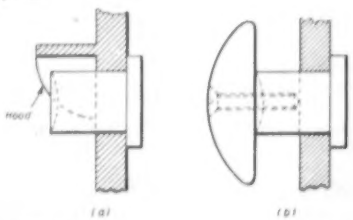
Temperature control is most critical in this process and three Electroflo Electronic indicating controllers are provided, one for each zone, while a 3-point recording instrument is also fitted in the control panel so that a positive visible check on thermal conditions throughout the process cycle may be obtained.

STOP-BUTTON SUGGESTIONS

MANUFACTURING practice varies considerably in the type of stop button fitted to industrial "push-button" motor starters of all types. In any one factory it will be an aid to safety if some simple and standard treatment of stop buttons be adopted, so that any employee will know how to stop equipment in emergency.

The first suggestion is the painting, then periodical repainting, of all stop buttons with bright red paint. The visibility of such buttons will aid their prompt operation when necessary.

In some starters both start and stop buttons may be protected from inadvertent operation by small hoods, as shown in Fig. 1 (*a*). It is suggested that this hood be removed, or reduced in size, around all stop buttons, so that the buttons can more quickly be operated; in general the additional risk of inadvertent operation so caused will be negligible.



Where a greater risk of inadvertent stopping of equipment can be accepted and extreme ease of stop-button operation is considered highly desirable, the stop-button "head" can be enlarged as shown in Fig. 1 (*b*). The enlargement is made by adding a mushroom-shaped piece of wood or insulating material. A modified door knob would often be suitable; this also should be painted bright red.

B. J. P.

Coal Mines and Chemical Works

Installations and Maintenance discussed at B.E.P.C.

INDUSTRIAL use of electricity had a bigger place than usual in the papers presented to the recent British Electrical Power Convention. Two sessions of the Convention were devoted to the theme "Electricity and the Industrial Future," and the main concern of the papers read at these was to forecast the future demand of various industries, and to put the industrial users' views to supply authorities. These aspects of the papers were reported in our issue of 7th July. However, two of the papers at least did not stop there. They went on to describe the installation and use of individual items of apparatus in relation to the special needs of the industries concerned. Pressure on space restricted full attention to this aspect of the papers in our earlier issue, and they are, therefore, summarised here.

Chemical Industry

The chemical industry in recent years has been markedly distinguished by a growing tendency to work continuously throughout the whole week day and night. Obviously in such cases electrical equipment must be capable of working for long periods without breaking down, as maintenance work cannot be done at night or during weekends, as is possible in "day" factories. This, together with the special dangers peculiar to some chemical production processes, presents many special requirements to equipment manufacturers. Much of the paper by Mr G. Nonhebel (I.C.I.) was concerned with this point.

It is obvious that equipment should be designed for easy maintenance. It is felt that accessibility for maintenance is not always given sufficient consideration, and that the electrical equipment manufacturer could help the chemical manufacturer here to formulate his exact needs. In particular, the machine designer should help determine what planned maintenance schedule is advisable, what spares should be kept in stock, and those which will be available at short notice from manufacturers even after a number of years.

In such continuous processes, continuity of supply is obviously of first importance. Duplicate supplies with balanced protection on feeders are common, tripping out the faulty feeder selectively. Automatic changeover circuit-breakers are found to be satisfactory, but they can introduce trouble due to current surging. High speed changeover equipment has, however, been used in several works for supplies to key motors up to 500 h.p. Automatic fuse changing gear has also proved useful in small unattended plants. Distribution equipment generally is likely to need frequent inspection and protective painting where corrosion is a hazard. The practice of "fit and forget" can seldom be followed in a chemical works.

Motors

Mr Nonhebel refers to experiments in Class A insulating materials as used in motors. He states that since the development of plastic coverings, there has been very little to choose between Class A and B insulation in respect of damp open situations where motors are run only occasionally. Previously the practice was to use totally enclosed Class A insulated motors in conditions where machines are run continuously, but ventilated motors with Class B glass type insulation for the conditions previously referred to.

Referring to flameproof motors, the author prefers wherever possible ordinary motors with pressure ventilation and pressure relay protection, or else motors arranged in a safe area with a drive through suitable glands in a wall. There is always the consideration that reduction in the number of flameproof motors enables supervision of the remainder to be more effective.

With regard to submersible motors, a specially interesting development is the squirrel cage motor run "naked" in an organic chemical medium. Such motors are specially designed with long narrow rotors fitted closely in the field structures, the latter being mush wound. The whole assembly can be mounted within a pressure vessel, immersed in the organic medium. The advantage of this arrangement is avoidance of a troublesome gland on pressure vessels, but initially a certain amount of trouble was experienced with the motor bearings.

Lighting

The only complication in lighting chemical works arises from corrosive atmospheres and explosive conditions. In some factories, pressurised fittings are used, and pressurised flameproof fluorescent lighting fittings have given satisfactory service in explosive filling buildings. However, special precautions have to be taken with pressurised incandescent lamp fittings to obviate danger from heat evolved by the lamp. Pressurisation is usually by means of air, nitrogen or carbon dioxide at a pressure of a few inches of water pumped from the lighting installation. Some form of relay to supervise that pressure is being held is essential. However, some plant managers do not like pressurised systems because of the additional maintenance problems involved. On occasions, "authorised" incandescent lamp fittings have been installed in the roof of the building so that the fittings are external to it, with their cover glass forming part of the ceiling. The fittings are in a light frame which would blow out in the event of an explosion. Another method that has been tried is the use of fluorescent U-tubes passing through glands in the outer wall of the building to terminals outside.

A hazard difficult to guard against in respect of drives is a potentially-explosive dusty atmosphere. The flameproof motor is not dustproof. In the absence of an appropriate B.S. specification, H.M. Chief Inspector of Explosives has issued a memorandum setting out conditions to be followed. However, it is obvious that further research and development by the industry is required, and it is understood that the E.R.A. is beginning work on design requirements of dustproof equipment.

Coal Mining

Maintenance considerations were also mentioned in the paper by Mr B. L. Metcalf (Chief Electrical and Mechanical Engineer, National Coal Board) "The Use of Electricity in the Coal Industry." He emphasised that maintenance of gate-end boxes which are used to control machinery adjacent to the coal face from a remote position, accounts for a large proportion of the mining electrician's time. A complete understanding of the circuits and electrical components used is necessary to enable him to deal effectively with this work and to keep stoppages due to electrical faults to a minimum.

In recent years, the British mining industry has introduced some modifications into its arrangements for earthing transformer supply gate-end boxes. Solid earthing as previously practised made it impossible to set a core-balance transformer earth leakage relay to operate at much under 5 amps. In 1947, a system was developed whereby the neutral point of the transformer could be coupled to earth through a spark gap or other overvoltage device. At each switch and gate-end box on the secondary side of the transformer the 3-phases are starred through an impedance of approximately 20,000 ohms and connected to earth through a relay. The relay in this case is a thyratron valve, and any earth current which flows will operate the valve and cause the controlling contactor to open. The maximum current which can flow will be of the order of 16 milliamps per gate-end box, thus with half a dozen gate-end boxes and a main switch the maximum current through the fault is of the order of 112 milliamps, a big step forward to safety. The system has the usual disadvantage of sensitive protection, in that a small fault, such as condensation may cause, brings out several gate-end boxes. Various developments are being tried to overcome these difficulties.

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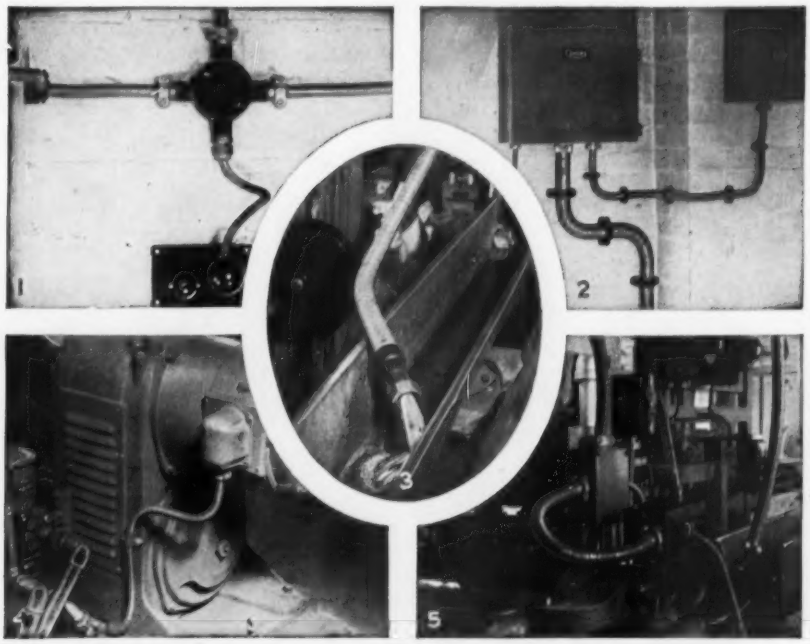

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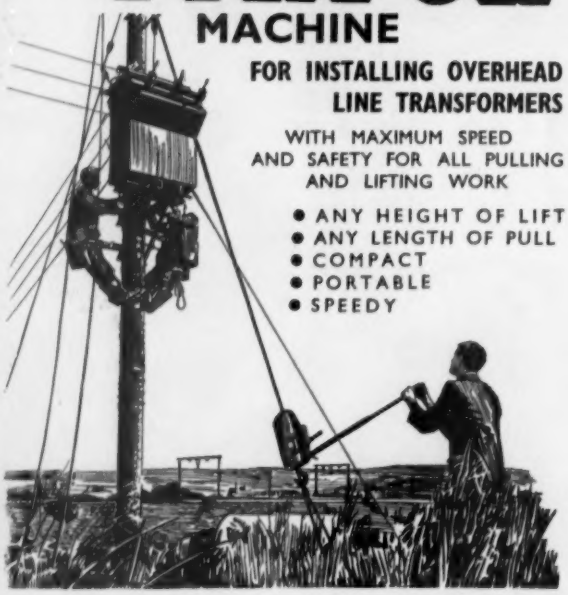

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Brookhirst Type YC Automatic Star/Delta Starter

DATA SHEET 18

THE Brookhirst a.c. Type YC starter is a stock item made for industrial use, which can be supplied in a number of arrangements. It is fully automatic, and typically consists of t.p. star and delta contactors, timing device, main contactor, t.p. solenoids, control circuit fuses and isolators. A number of optional extras are available. This Data Sheet deals with the basic construction of the range.

The starter described consists of a bulk produced unit in dust-protecting wall-fixing sheet steel case.

The starter as illustrated in Fig. 1 is a good example of a heavy duty, robustly constructed control gear for industrial motors. The case is quite large for the horse-power rating covered leaving plenty of space for inspection and for cable runs.

Construction

The main body is of ¼ in. steel, welded to a back frame with bolted fittings. The hinged pressed lid is provided with a dustproof grommet and fixed with 4 quick release bolts with two start threads. The local push-button station is on the front of the lid and provision is made for an ammeter on top of the case and for hand re-setting of the overload on the left-hand side if necessary. No conduit entries are made but a large gland plate 15 in. x 6 in. is bolted to the bottom of the case to be drilled as required.

Electrical parts are mounted on a ¼ in. insulated composite panel fixed with 4 bolts to side brackets and the general layout can be seen from Fig. 1. The back of the starter is also removable.

This starter differs from many others on the market today in that few mouldings are used in its construction. With the exception of the isolator most of the parts are of pressed steel or non-ferrous metals, machined from the solid or cut from extruded sections. The various contactors are built on to the insulated panel; thus everything is visible in its working condition (except, of course, the dashpots and heater timer), plenty of space being allowed and the general method of construction would permit repairs being made if necessary, pending the arrival of a new part. This is not always the case with many other contactors on the market where the intricate moulded construction used precludes emergency repairing.

Any such repair would not be the result of normal use because the whole starter is so robustly built, all leads and conductors being of very generous proportions, fixings are very secure with lock nuts or lock washers in most places.

At the bottom right of the case is the double break isolator operated by the side handle interlocking with the lid. The isolator shorting contacts, spring loaded and laminated, are of interest. A pair of auxiliary contacts also operated by the isolator control open before the main phases.

From the isolator current is fed to the main contactor Fig. 1 (A) and to the star and delta contactors (E) and (B).

Below the main contactors is fitted a small transformer supplying current to the heater time relay fixed at (G) and the main overload dashpot release unit on the bottom left at (J).

Two control circuit fuses are supplied (F) and main H.R.C. line fuses can be fitted if necessary (except where inching is specified as an extra).

The Contactors

All three contactors are of similar construction but only the main contactor is provided with blow out coils. In Fig. 2, the main frame carries the E magnet and the hinge on which pivots the U-shaped section (8) carrying two bakelite insulated steel rods (11).

The armature proper is freely self-aligning since it is rubber mounted and supported by the pin (9). A stirrup frame (7) with removable stop bar restricts the opening of the contactor. The contactor is gravity controlled.

The two support rods carry the three phase contacts of conventional shape and at one end is also fixed an auxiliary switch or switches as the case may be.

The main contactor only is fitted with blow out coils the side cheeks of which serve to retain the porcelain arc chutes.

The Overload Releases

This is a self-contained unit with 3 overload release dashpot controlled (see Fig. 2). The dashpot is of large diameter so permitting a long time lag with a short

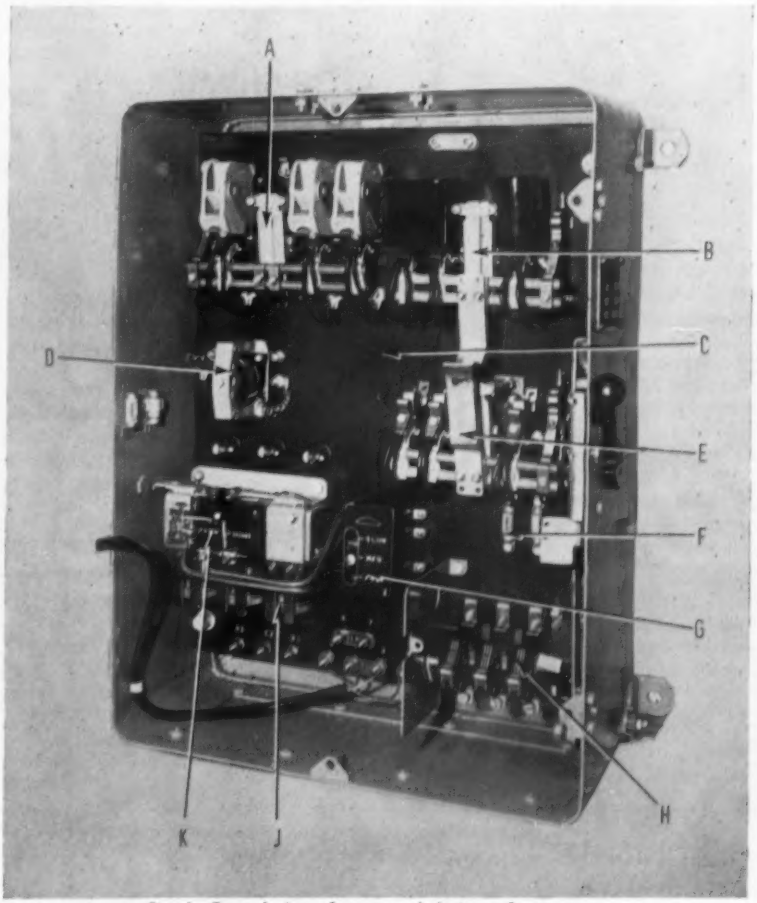
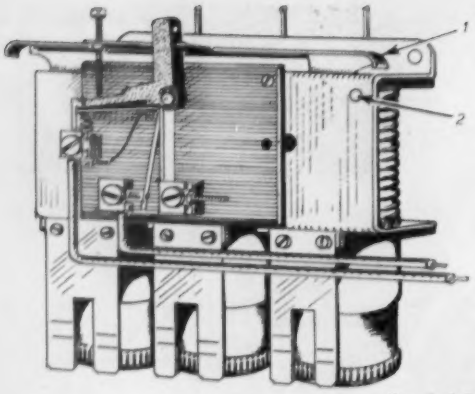


Fig. 1. General view of starter. Indexing refers to text



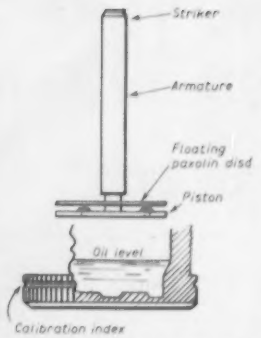
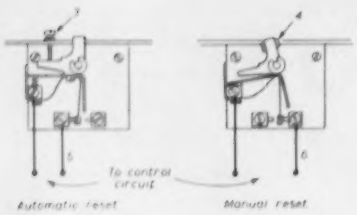
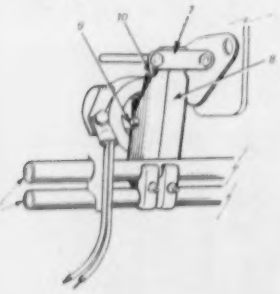


Fig. 2, left, shows the overload unit with main contactor details, bottom. Fig. 3, above, shows one of the overload release dashpots





travel. The piston is also shown in the illustration.

Movement of the piston on overload raises the striker pin and moves the trip bar (Fig. 2) which in turn opens the trip circuit contacts.

The Timing Device

This item (Fig. 4) is mounted on a moulded base to which are attached two pillars carrying a bow-shaped bimetal heater strip bearing two silver contacts, only one pair of which is used in the starter under review. Current is fed from the transformer (D) Fig. 1 to the heater via any one of the three tappings marked "Slow," "Medium" and "Fast" on the lid. The insertion of the adjusting screw in the requisite hole completes the circuit. Thus, when cold, X is joined to Y and to Z and after the starter is switched on and the heater operates the bow spring passes over dead centre and opens the Z circuit. Further adjustment can also be made to the fixed contact.

Maintenance

It is always apparent in these well made contactors that maintenance can be kept to the minimum. The following points should be noted:

The Contactors

Remove the arc chute and swing back blow-out cheeks, release stop bar 7 (Fig. 2) allowing the armature with the moving contacts to swing down. All parts can now be reached and contacts changed if necessary, each of which is fixed by one 2 B.A. screw. All nuts and bolts must be tight and the magnet faces free from rust. The gap between the centre limb of the E magnet and the armature face should be ·004 in.-·008 in. when closed. Contact must make when the gap between the armature and the top of the upper limb of the magnet (10) is ·112 in. - ·154 in.

Since the contacts are not individually adjustable, they must be equal in thickness to ensure simultaneous closing, and contacts thinned by burning should be replaced. The contact pressure when closed should not be less than 15 oz.

The pivot can be lightly oiled but keep oil away from the rubber support in the armature.

The Heater Timer

This should need little attention beyond adjustment. The unit is removed by undoing the 4 nuts on the pillars supporting it. The lid is retained by one screw at the back of the moulded base. Since the operating voltage is very low, about 1 V, all terminals must be kept tight and the flexible pigtails must be sound.

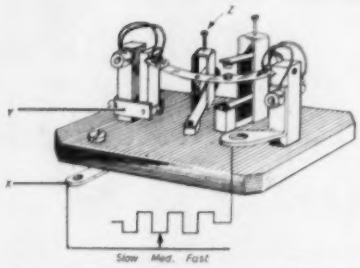


Fig. 4. Timing device controlling period of change over from star to delta

The Overload

There is little to go wrong with this unit. When first installed the dashpots must be filled with oil to the level indicated on the diagram attached to the unit and care must be taken that the reset washers are free to move on the pistons.

There is normally no provision for varying the tripping time other than by varying the viscosity of the oil. This is normally Triple Shell or Mobiloil BB but a heavier oil can be used for high ambient temperatures, or for a very long time delay.

Changing from Automatic to Hand Re-setting

This change is rather unusual, the spare parts required being "parked" in the hole 2 Fig. 2. This part is a round-headed 4 B.A. bolt with a nut and must be fixed at 4 Fig. 2 to change to hand reset. Also the adjusting screw 3 must be removed and stored in the hole 2 for future use. Finally lead (5) must be changed to position (6). The drawing shows the two arrangements. A push-button will have to be fitted in the hole, now blanked off in the left hand side of the case, for manual operation.

Occasional lubrication is required on the handle and isolator mechanism.

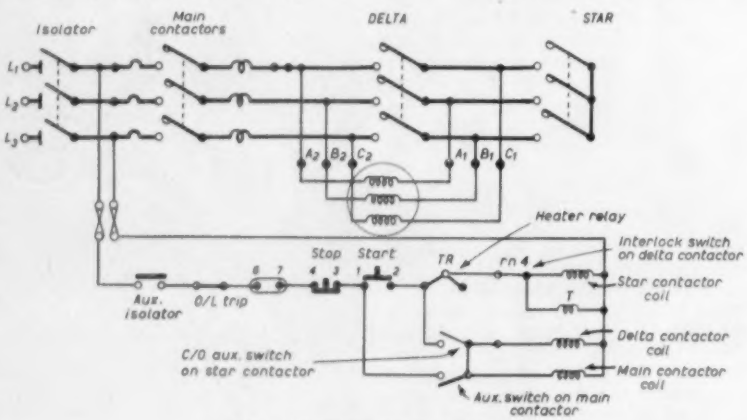


Fig. 5. Schematic circuit of starter

FLUXMETER or BALLISTIC GALVANOMETER?

Recent Developments Swing the Preference

By E. H. W. BANNER, T.D., M.Sc., M.I.E.E., M.I.Mech.E., F.Inst.P.

THE fluxmeter and ballistic galvanometer, the theory of each being well known, have comparable functions in that they both measure a quantity, either in line-turns or current-time, covering magnetic fields and capacitance measurements. Although the two instruments operate quite differently, constructionally they each comprise a moving coil in a permanent magnetic field. The fluxmeter provides a nearly steady reading, while the other gives a ballistic or transient reading. Also, in the former case, the restoring torque is a minimum while the ballistic galvanometer has a torque which is low and comparable to that of a galvanometer of generally similar construction.

The fundamental difference between the two instruments is that the fluxmeter is required to be heavily overdamped whatever the external resistance, but the ballistic galvanometer is always underdamped, commonly with a formerless coil. Fig. 1 illustrates these differences simply, and they are summed up in the Table below.

FLUXMETER	BALLISTIC GALVANOMETER
Nearly steady reading slowly drifting to zero	Ballistic or transient reading.
Responds nearly instantaneously	Responds slowly.
Low inertia of moving system.	High inertia of moving system.
Overdamped.	Underdamped.
Discharge may be long	Discharge must be short
Negligible torque.	Low torque, as for galvanometer.

An essential operational difference in the use of these instruments is that in the case of the ballistic galvanometer the impulse applied to it must be so short that it is completed before the moving system commences to move, while with the fluxmeter the impulse discharged to it may take several seconds. This latter point is an important advantage in work with iron circuits, where time-constants may be long.

For maximum utility it should be possible to use search coils with a large area-turns factor, while having small physical dimensions, thus implying a large number of turns which must be of fine wire and hence have high resistance.

Fluxmeter Developments

The ballistic galvanometer has the obvious disadvantage that it requires more skill in its reading, being transient, but its generally higher sensitivity has in the past led to its wider use than the fluxmeter, for instances where either would serve the purpose. This higher sensitivity has been largely on account of the single suspension, instead of double pivoting, but with the need for levelling and complete lack of portability. Quite recently the fluxmeter has been further developed in several respects, including the use of a single suspension to increase sensitivity, and being mounted in a case complete with its light source and scale, allowing an increased scale length over that obtainable with a pointer instrument. A further point is in connection with the reduction of the drift rate, which sets a limit to close reading. Since the reading of a fluxmeter will slowly tend to drift back to zero, the reduction of this tendency is of great importance and a criterion may be established by this drift rate, expressed as a percentage of the drift backwards in reading after one second from the application of the impulse.

New Design

In a new design of self-contained single-suspension reflecting fluxmeter the drift rate is about 0·15% under short-circuit conditions. In practice an instrument requires to be connected externally for it to be used, and in the case

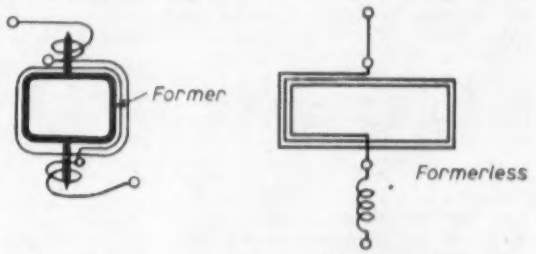


Fig. 1. Fluxmeter (left) and ballistic galvanometer (right) coil construction

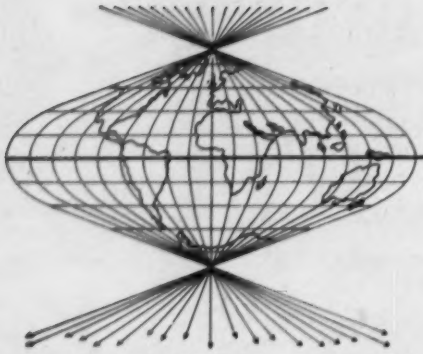
of a search coil or other external circuit where the external resistance equals the internal resistance the drift rate is doubled, or 0·3%. The general expression is that the drift rate is multiplied by $\frac{R+R_X}{R}$ where R is the fluxmeter resistance, and R_X the external resistance.

The actual coil of this particular design of fluxmeter is about 90 ohms, and if a search coil of high resistance has to be used then the drift rate will increase: but it may still be only 1% for a search coil resistance exceeding 500 ohms.

These improvements have made the fluxmeter of wider application than formerly, and in many instances it is now of more use than is the ballistic galvanometer. The working torque of the fluxmeter being very low, a high critical damping resistance results when the instrument is used as a deflectional galvanometer, in which case the current sensitivity is very high. For this fluxmeter the critical resistance is about 22,000 ohms and the corresponding current sensitivity about 2,000 mm per microamp on the scale provided in the instrument case. The special galvanometer applications are thus to high-resistance circuits such as those of emission photocells and the like. As a galvanometer it has a long periodic time of 15 to 25 sec.

When used in its normal capacity as a fluxmeter the scale sensitivity is 700,000 line-turns for full-scale deflection of 140 mm, within industrial accuracy. Since the drift rate is very low, inconveniently slow working would result in the absence of any aid to zero restoration and an electrical device under manual control provides this facility, thus further aiding the scope of the fluxmeter.

Acknowledgment is made to Messrs W. G. Pye and Company Limited for permission to quote their "Scalamp" fluxmeter.



OVERSEAS NEWS

A SUMMARY OF IMPORTANT EVENTS

CANADA

Distribution Work

The British Columbia Power Commission has authorised the expenditure of more than $2 millions on capital additions and improvements to distribution systems during the current year. Such work is to be carried out in all of the commission's 26 power districts throughout the province.

Station Extension

Construction is to begin this year on a new extension to the Estavan power station of the Saskatchewan. The new extension is to house a 30 MW turbo-generator ordered from the Metropolitan-Vickers Electrical Co., which will raise the capacity of the plant to 72,750 kW. It is expected that this new set will be placed in commission late in 1956. The Power Corporation has ordered two 200 klb/hr spreader stoker-fired boilers from Foster-Wheeler Ltd., which will burn local lognite coal.

New H.Q.

The contract for the construction of the new 21-storey head offices of the British Columbia Electric Co., Ltd., has been placed with John Laing and Son (Canada), a subsidiary of the British firm. Among the features of the new building will be lifts which will not operate if overloaded. The building, which will have an outer skin of glass and enamelled steel, is to have off-peak electric heating, while special heating cables are also to be laid under adjacent pavements and drives to keep them free of ice and snow in winter.

Future Estimates

Demand for electric power in Canada will probably expand to 14·3 million kWh in 1958, according to a survey by the Bureau of Statistics in co-operation with the Canadian Electrical Association, whose members generate most of the electricity used. The 1958 prediction in firm power peak load demand represents an increase of 30% over 11·1 million kWh in 1954 at a growth rate of 7% a year. The 1954 figure was in turn 33% higher than the 8·3 million kWh in 1950, representing an annual growth rate of 7·5%. But the experts are confident that the demand will be met, for they anticipate that by 1958 the gross production capability will rise to 16·4 million kWh, an increase of 25% over the total for 1954 (13·1 million kWh) which in turn was 43% above the 1950 figure (9·1 million kWh).

BARBADOS

Undertaking Transferred

The undertaking of the Barbados Electric Supply Corporation Ltd. has now been transferred to the newly-formed subsidiary, the Barbados Light and Power Co., Ltd. This move will enable the new company to raise additional finance locally to assist in its plan to build a new steam generating station, to which we have already referred. The Colonial Development Corporation has already agreed to loan the company £250,000 for the purpose. The Barbados Government, although willing to take some shares, have indicated that they have no intention of sharing in the ownership of the new concern.

SOUTH AMERICA

Ecuador's Hopes

With the demand for electricity already exceeding the available plant capacity in many areas, Ecuador is taking steps to increase the generating capacity as quickly as possible. A survey drawn up by an outside engineer two years ago proposed utilising hydro-electric resources to provide about 122 MW of generating capacity, but it seems that the plan has not advanced far towards fulfilment. In the meantime a new organisation is being formed to take over the electricity supply undertaking so far operated by the Quito Municipality. This concern is to have a capital of sucres 35m, part of which will be subscribed by the Municipality. It is hoped that the new concern will be able to secure a loan from the International Bank for Reconstruction to assist in financing a new power project.

EUROPE

Expansion in France

Electricity consumption in France last year increased by 9% to a total of 45,300 million units, according to the report for 1954 of Electricité de France, the nationalised undertaking. Of the total output, hydro-electric stations provided rather more than half. As to future generation prospects, it is anticipated that by 1960 some 100 MW of electricity will be produced by nuclear energy plant, the first 5,000 kW of which is scheduled for next year. Reference is also made to the La Rance scheme, on the Brittany coast, where it is proposed to utilise tidal power in the generation of electricity. Proposals so far put forward suggest the installation of twenty-six 8,000 kW generators, which, it is estimated, could provide 550 million units annually. In the annual report it is stated that the prospects for the scheme are improved by the discovery of a technique enabling the turbines to function when the water level is rising, as well as when it is falling. A plea is also made for the acceleration and enlargement of the programme set up under the second Monnet plan, as well as for the elaboration of a third, to meet the increasing demand for power.

French-Spain Connections

Fuersaz Electricas de Cataluna are reported to be negotiating with the French electricity authority, Electricité de France, to establish a further link between the French and the Spanish systems via the valley of Aran. Plans are also being discussed to raise the capacity of the link via Andorra. If these schemes reach fruition, total capacity of the Pyrenees transmission lines will be raised to 150,000 kW, and it is thought that the additional French exports to Spain made possible in the summer season will ensure that no electricity cuts will be imposed in Spain this summer and autumn.

Line to Sicily

To permit the erection of cables across the Messina Straits, the latter is being closed to shipping until the end of this month. This overhead line between Sicily and the mainland will be the longest transmission span of its type in the world. Ultimately it will operate at 220 kV, but in the first stage there will be one 150 kV circuit with a capacity of 50 MW. Towers 735 ft high have been erected on each side of the Straits, the crossing span having a horizontal length of 11,950 ft. The distance between conductors will be 82 ft, there being provision for six lines ultimately. Construction work on the scheme started in Jan., 1952.

GREECE

Another Scheme

Work is expected to begin next month on what will be one of the largest hydro-

electric schemes in Greece, the 84,000 kW project at Megdova. Construction work is being undertaken by the French firm Omnium-Lyonnais for the Greek Public Power Corporation. It is hoped to complete the scheme by the end of 1958.

MIDDLE EAST

Factory Plant Contract

A contract valued at over £600,000 for the electrical plants for two cement factories has been placed with the English Electric Co. by the Iraq Development Board. The two factories are to be built at Mosul and at Sirchanar, in Sulainaiyah province, near the Iranian frontier. There was keen foreign competition for the contract, the English Electric Co's price being £44,000 below that of a German firm, we understand.

Baghdad Take over

Sept. 1 next has been fixed as the date on which the undertaking of the Baghdad Light and Power Co., will be transferred to the Iraq Government, it is now announced. The Minister of Finance, Dr Dhia Jafar, has also stated that the question of ordering additional generating plant will be dealt with immediately after the transfer. Nationalisation of the undertaking is to be announced by decree, but it is proposed that the present management would continue to operate the undertaking on contract to the Government of Iraq, according to the Minister. We reported on 30 June that Sir Kinahan Cornwallis, chairman of the Baghdad Light and Power Co. considered the terms of the sale of the undertaking (for £2·4m) did not correspond to a freely negotiated sale between a willing seller and a willing buyer. The Minister of Finance has now called the acquisition "Nationalisation by agreement."

PAKISTAN

New Station

To meet the urgent need for power and further encourage the development of industries in the state, the Government of Khairpur, Pakistan, propose to build a new central power station which will have four 5,000 kW generators. It is likely that the plant will be gas-fired to utilise natural gas which is to be obtained from the Sui Gas field.

AUSTRALIA

Country Supplies

The State Electricity Commission of Queensland's country town supply scheme continues to progress apace. The Mines Minister, Mr. McCathie, switched on supplies to two more towns—Injune and Wyandra—a few days ago. Since the scheme was started in 1952, 21 towns have been given their own supply. Schemes under construction, and to be commissioned this year, are at Normanton, Bluff and Irvinebank. Work on a similar scheme for Wandoan is in hand, and a scheme at Cooktown should be commissioned soon. Plans are also in hand for plants for several other country towns. Mr McCathie has said that the average cost of these schemes is about £25,000, including a home for the superintendent. The schemes had proved to be self-supporting with annual surplus ranging up to £1,000. Altogether about £2m had been spent on the schemes so far.

Port Augusta "B" Problem

In addition to the order for two 60 MW turbo-alternators for the Port Augusta "B" power station, placed by the Electricity Trust of South Australia (which we noted on 30 June), a contract valued at £50,000 has been given to C. A. Parsons and Co., Ltd., of Whyalla (the firm's local factory) for the associated condensing and feed heating plant. Delivery of the first turbo-alternator is scheduled for Mar., 1959, with the second to follow a year later. In the preparation of plans for Port Augusta "B" one snag has arisen—the question of cooling water. The "A" station is being constructed at the edge of the deep water channel at Curlew Point, four miles from Port Augusta, on an artificial island connected by a causeway to the mainland. For the "B" station, the causeway is to be extended, as it is estimated that this method will save £500,000 on pipes which would have been required to carry sea water for the condensing plant if the station had been built on the mainland. It is realised, however, that water discharged from the "A" station will warm the sea water so much that it will not be an effective cooling agent for the "B" station. Engineers at Adelaide University are now studying the matter and carrying out experiments, the idea being to devise a deflecting wall which could be constructed at the side of the "A" power station to send the returned water in a definite channel away from the area from which the "B" station will draw its cold water.

Tasmania's Peak

Due to the extremely cold weather, the load of the system of the Hydro-Electric Power Commission of Tasmania reached a record peak of 282,290 kW a few days ago. During that particular day 5,056,820 units were generated by the seven power stations in the system. Tungatinal contributed 31·9%, Tarraleah 29·2% and Trevallyn 28·4%, bearing the major portion of the load. Waddamana hydro-electric station, which has an installed capacity of 135,300 h.p. generated only 6·1% of the total output, for, in an effort to build up the storage of Great Lake, the station has been eased off for some weeks.

The 150,000 h.p. power station at Corner Brook, Newfoundland, which is now administered by the recently formed Bowater Power Co., Ltd., is illustrated below. The station meets the power requirements of Bowater's Newfoundland Pulp and Paper Mills Ltd.—one of the largest integrated pulp and paper mills in the world —together with those of the communities of Corner Brook and several other industries in the area. There are prospects of further expansion. Total power sales from the station for the current year are estimated at 673 million units, of which the paper concern will take 525 millions. The penstocks which carry water from Grand Lake Canal to the power station situated on the shores of Deer Lake below, are partially underground, it will be noticed. Cut timber floated from the various logging areas takes a short cut from Grand Lake to Deer Lake through a sluice, seen on the right of the penstocks, and are then collected in a holding boom

Personalities

IN THE INDUSTRY

Chosen to be the new power station superintendent at Bankside "A" and "B" power stations, London Division, C.E.A., with effect from 1 Aug., is **Mr A. G. Cox,** ASSOC.I.E.E., A.M.INST.F., who has held a similar post at the Division's Blackwall Point generating station since early in 1951. Mr. Cox succeeds **Mr H. Topley,** A.M.I.E.E., who has retired, as we have already noted. Before going to Blackwall Point, Mr Cox served at Barking power station for five years, for the last four as mechanical maintenance superintendent. He began his career in the industry, with the Folkestone Electricity Supply Co. (a County company), as a pupil to the late Mr Thomas Hesketh, the engineer and manager, and stayed with that undertaking till the end of 1945, holding the position of generation engineer from 1933 onwards. He was transferred to Barking power station in 1946 as part of the post-war reorganisation of the County group of companies.

At present with the Electrical and Controls Division of Hopkinsons Ltd., **Mr G. W. Turton,** M.I.MECH.E., is joining J. H. Humphreys and Sons Ltd., as general manager as from 8 Aug.

Chief electrical engineer of the Aluminium Wire and Cable Co., Ltd., since its formation, **Mr C. H. E. Ridpath,** B.SC., M.I.E.E., A.M.I.MECH.E., has now been appointed consulting electrical engineer to the company. He will continue to act in that capacity after the normal date of his retirement next Apr., having completed over 42 years continuous service in the Aluminium Industry. His successor as chief electrical engineer of the Aluminium Wire and Cable Co., Ltd., is **Mr W. J. Nicholls,** B.SC., A.C.G.I., M.INST. C.E., M.I.E.E., ASSOC.M.AMER.I.E.E., who has had long and extensive experience of overhead transmission engineering. He was with the Foundation Co., Ltd., under Mr J. L. Eve until 1929 when he joined Kennedy and Donkin Ltd., the consulting engineers. He was engaged on the whole of the grid construction in S.W. England and South Wales, and can claim a unique experience of h.v. transmission in this country both on the established 132 kV network and in the initiation of the 275 kV system. In 1936 he became assistant to Mr J. A. Lee, construction engineer of the Central Electricity Board, with whom, and later with the B.E.A., he specialised in the design of o.h. transmission lines. He joined the Aluminium Wire and Cable Co. in June 1950 as assistant to Mr C. H. E. Ridpath.

Col H. T. Thornley, managing director of J. and H. McLaren, Ltd., a Brush Group subsidiary, is relinquishing that position on 27 Aug. to join the staff at Group headquarters in London. His new appointment will be director of administration and supply. He will be directly responsible to Mr. Miles Beevor, managing director of the Brush Group, Ltd.

Station superintendent of Darlington power station since 1941, **Mr C. T. Port,** A.M.I.E.E., is to retire shortly on reaching the age of 60. A native of Darlington, Mr Port received his technical education at Darlington Technical College. After experience in electrical instrument making and a short period on industrial plant installation and maintenance, he joined the staff of Darlington power station in 1913, where he successively held the position of switchboard attendant, shift charge engineer, maintenance engineer, and from 1941, station superintendent.

The directors of the Telegraph Construction and Maintenance Co., Ltd., announce the establishment of a metals group and the appointment of **Mr W. F. Randall,** B.SC., A.R.S.M., M.I.E.E., F.I.M., a director of Telcon, as managing director of the group. In addition to the new Crawley metals factory, the group embraces Telcon-Magnetic Cores Ltd., Temco Ltd., Sankey-Telcon Ltd., and the recently acquired Magnetic and Electrical Alloys Ltd. Mr Randall joined the Telegraph Construction and Maintenance Co., Ltd., in 1922 as a research metallurgist, and became manager of the Metals Section in 1925. He has been a director of the company since 1945, and was chairman of the Radio and Electronic Components Manufacturers' Federation last year.

The appointments of a new comptroller and a budget manager for the Yale and Towne Manufacturing Co.'s Lock and Hardware Division at Willenhall and the Materials Handling Division at Wednesfield, Staffs, is announced. The new comptroller is **Mr J. O. Sewell,** who has held a similar post with the Canadian Division for eight years, and the budget manager is **Mr B. A. Shortman,** who has been comptroller for the past five years.

Wm. Sanders and Co. (Wednesbury) Ltd. have appointed **Mr A. M. Canto** as their sales manager. Apprenticed with Higgs Motors Ltd., Mr Canto joined first the Metropolitan-Vickers Electrical Co. and later George Ellison Ltd., with whom he was associated for many years before moving to Westool Ltd., which company he now leaves to take up his present appointment.

Appointed as chief of the Test Division of Marconi's Wireless Telegraph Co., Ltd., is **Mr E. H. Evans,** who has succeeded **Mr F. G. Robb,** who has retired. Mr Robb served with Marconi's for thirty-six years, first in the company's Test Division, later moving on to Designs and to Development. He worked on beam transmitters during the development of the Marconi-Franklin short-wave beam system which links the countries of the Commonwealth. He was one of the team engaged in the design of the prototype 100 kW short-wave transmitter for the B.B.C., and later, this same team was responsible for the design of much of the transmitting equipment at Alexandra Palace. When war came in 1939, he was seconded to the Admiralty and became chief of Admiralty Radar Test. He was appointed chief of Marconi's Test Divi-

Mr C. H. E. Ridpath

Mr W. J. Nicholls

Mr W. F. Randall

Mr A. M. Canto

Mr E. H. Evans

sion in 1948. Mr Evans, his successor, joined Marconi's in 1913. He has been associated with the Test Division throughout his service, and for a number of years had been chief of Receiver Test. The company also announce that **Mr R. E. Burnett,** M.A.(OXON), A.M.I.E.E., A.INST.P., who has been assistant to the general manager for special duties, as well as manager of Education and Technical Personnel and principal of Marconi College, has now been appointed full-time assistant to the general manager. His duties as manager of Education and Technical Personnel will be undertaken by **Mr E. R. L. Lewis,** M.A., A.M.I.E.E., who has for some time been acting as his deputy in this sphere. **Mr R. G. Hulse,** B.SC.(HONS.), who has been deputy principal of Marconi College during the same period, has now been appointed principal of the College.

From William Geipel Ltd. we learn that **Mr C. A. Baker,** A.M.I.E.E., has been appointed a service director of the company. He has been in charge of the firm's electric control gear side at Vulcan Works, Bermondsey, since 1946.

Appointed as director-general of the Purchasing and Stores Department of the National Coal Board—a new post—is **Mr J. M. Grammer,** who is at present controller of services to the North Thames Gas Board.

Further "His Master's Voice" radio and television sales appointments are announced. These are: **Mr R. J. J. Andrew** as area representative for Manchester and district, North East Cheshire and Lancashire (South of Liverpool/Salford), and **Mr P. W. Hartley** as area representative for Cumberland, Westmorland and Lancashire (North of Liverpool/Salford).

Until recently manager of the Karachi office of Babcock and Wilcox Ltd. **Mr A. W. Hanson** is taking over the managership of the company's Newcastle office, with **Mr P. R. Bettle** as his deputy. Mr Hanson, who has wide experience in marine engineering, was formerly chief inspector of boilers to the Burma Government, and joined the Service Department of Babcock and Wilcox Ltd in 1946. He opened up the Karachi office in 1949.

Our accompanying photograph was taken during a recent visit of H.M. Postmaster-General to the works of Submarine Cables Ltd. It shows **Dr Charles Hill** being shown a particular feature by **Mr F. H. S. Lemon,** manager of Submarine Cables Ltd. Looking on is **Sir Gordon Radley,** deputy director general of the Post Office. On the right is **Dr E. W. Smith,** a director of the company, and in the background, **Mr R. J. Halsey,** assistant engineer in chief of the Post Office.

Studying submarine cable manufacture

Following the death of Mr J. J. Conlan (noted last week), the British Electrical and Allied Manufacturers' Association have appointed **Mr A. W. Bailey** as Head of the Statistical Department, and **Mr R. F. Masters** as Editor of *The BEAMA Journal*. Mr Bailey, who is an economics graduate of London University, has been a member of the statistical department since 1946. Mr Masters has been Mr Conlan's assistant on the journal since 1950, and was earlier with Marconi's and S.T.C.

Mr I. M. Mackay

Mr J. A. Smale

Formerly assistant commercial engineer, **Mr Ian M. Mackay,** B.SC., A.M.INST.C.E., has been promoted to deputy chief commercial officer of the South Eastern Electricity Board. Born in Edinburgh, Mr Mackay graduated at the University there. After some years in civil and railway engineering—including a visit to South America—he spent five years on the teaching staff at Leeds University, specialising in agricultural engineering. In 1936 he was appointed to the sales staff of the Yorkshire Electric Power Co. and just before the war was made a district manager. Among the first staff appointed by Seeboard when setting up its headquarters at Hove, Mr Mackay has been primarily concerned with tariffs, hire and hire purchase and agricultural development. He serves on committees of the British Electrical Development Association and Electrical Research Association dealing with rural electrification.

Mr J. A. Smale, C.B.E., A.F.C., B.SC., M.I.E.E., engineer-in-chief of Cable and Wireless Ltd., has been appointed by the Government of Cyprus to be the first chairman of the new Cyprus Inland Telecommunications Authority. The appointment is a part-time one, and Mr Smale will continue to serve Cable and Wireless Ltd. in his present post, visiting Cyprus as necessary.

Two new directors of Edgar Allen and Co., Ltd., are **Mr B. B. Green,** M.C., who will also act as assistant to Mr H. D. Boyd, general sales manager of the company, and **Mr W. J. McBride,** A.M.I., MECH.E., who remains general manager of the Engineering Department, and a director of the British Rema Manufacturing Co., Ltd.

Mr H. H. Hatton has been appointed assistant manager of the Liverpool Branch of the General Electric Co., Ltd. Educated at King Edward VI School, Stratford-on-Avon, Mr Hatton joined the G.E.C. in 1933 as a student apprentice at the company's Witton Engineering Works. Subsequently, he was appointed to the Engineering Estimating Department and Export Sales Department at Witton. In 1939, he joined Manchester Branch Engineering Department, and except for a short period of military service, was chiefly engaged on Admiralty contract work throughout the war. In 1946 he was appointed to the Industrial Sales Department, and in 1950, became manager of Industrial Sales Department at Liverpool Branch.

Mr J. Y. Dick, of Oliver Melville and Co., Ltd., Kirkcaldy, has taken the place of **Mr D. G. Lindsay,** A.M.I.E.E., to represent the Electrical Contractors Association of Scotland on the Electrical Fair Trading Council.

General manager of the Windsor (Ontario) Utilities Commission for 20 years, **Mr J. Clark Keith** has retired this month. The Hydro-Electric Power Commission of Ontario's second largest steam generating station was named after him in recognition of the invaluable part he had played in electrifying the region.

Mr J. S. Dumeresque, A.M.I.E.E., has been appointed general manager of Semtex Ltd., the Dunlop subsidiary. Born in London 48 years ago, Mr Dumeresque gained electrical training at Faraday House. After two years with the Sunbeam Motor Co. and Ferranti Ltd., he was appointed an assistant to the late Sir Henry Royce in Messrs. Royce Ltd. In 1929 he went to India as operating manager of the Western Electric Co. and was with them until 1935. In 1936 he opened up broadcasting in Malaya as general manager and chief engineer of the British Malaya Broadcasting Corporation and later, when the Government took over broadcasting early in the war, was the first Director of the Department of Broadcasting in Malaya. During the war he served with the Political Intelligence Department of the British Embassy in Washington and as a colonel on the staff of Lord Louis Mountbatten in Ceylon and Malaya. During the British Military Administration of Malaya, he was in charge of public relations, newspapers, films, broadcasting, censorship and printing. He joined the Dunlop Rubber Co. after retirement from the Colonial Service and has recently been in India. He returned to England in May this year.

Following the retirement of **Mr H. R. London** from the position of station superintendent at the St. Marylebone power station, London Division, C.E.A., **Mr M. G. Crockett,** M.INST.F., has been appointed to fill that post. Mr Crockett gained early experience in the mining industry before going to St. Marylebone in 1924 where he has remained through successive stages of promotion. The Division also announce that **Mr C. E. Sheppard,** A.M.I.E.E., has been appointed superintendent at Bow generating station, to succeed **Mr W. W. Brown** who is retiring. Mr Sheppard started with the Metropolitan Electric Supply Co. in 1924, and transferred to the London Power Co. at Acton Lane in 1935. Since vesting day he has held positions at Deptford East and Fulham, and since 1952 has been deputy superintendent at Bow power station.

Manager of the Midlands Electricity Board's Shropshire and Herefordshire sub-area **Mr William Winwood,** M.I.E.E., last Saturday married **Miss B. M. J. Evans,** until recently housecraft adviser in charge of the Board's Service Training Centre at Aston Fields. Congratulations!

Seven more employees of E. K. Cole Ltd. were last week presented with long-service awards (gold watches) to mark the completion of 25 years' service to the company. The presentations were made by **Mr E. K. Cole,** chairman and managing director.

District commercial engineer at Rugby for the East Midlands Electricity Board, **Mr A. Franklin** has retired and has been succeeded by **Mr D. V. Weston,** his former chief assistant. At a farewell gathering last Friday, Mr Franklin was presented with an electric water heater by his colleagues.

Mr R. E. Gleadow, A.M.I.E.E., who has been district commercial engineer at Tunbridge Wells to the South Eastern Electricity Board, has been appointed to a similar position at Bolton with the North Western Electricity Board, with effect from 1 Sept. Before going to Tunbridge Wells, Mr Gleadow was for two years at Goole following a period with the Hull undertaking.

Mr W. H. R. Webb has accepted an appointment from the United Nations Technical Assistance Administration as a railway signalling expert to Iran. The appointment, which was made at the request of the Government of Iran, is part of the United Nations programme to assist the less developed countries and areas in their programmes of economic development. From 1924 to 1930 Mr Webb was a member of the Westinghouse Brake and Signal Co., and from 1930 to 1940 he was employed by Metropolitan-Vickers General Railway Signal Co. Later he served with several American engineering and railway firms.

Mr. W. W. Duff, A.A.C.C.A., A.C.I.S., has been appointed deputy chief accountant to the Uganda Electricity Board. Mr Duff was born and educated in Scotland. During the war he served as Lieutenant, R.N.V.R., and has latterly been on the staff of the Accountant General in Uganda.

OBITUARY

Mr. George Ellison, chairman and founder of the George Ellison group of companies, died in Switzerland on 17 July, aged 82. Mr Ellison was another of the pioneers in the Electrical Engineering Industry—back in 1898 he was producing switchgear in Paris, where he gained the title of Father of the French Switchgear Industry. He founded the British firm of George Ellison Ltd. in 1906, and in 1929 he founded Tufnol Ltd. under its former name of Ellison Insulations Ltd.

Sir Richard Allen, C.B.E., D.L., chairman of W. H. Allen Sons and Co., Ltd., died on 17 July, aged 88. He was a past-president of the Institution of Mechanical Engineers and a member of the I.E.E.

Mr Charles L. Hall, of Balfour, Beatty and Co., died on 16 July, aged 65. He had been at the London office since 1938, as senior engineer on design, being concerned with many hydro-electric schemes. He retired in May.

Mr H. E. Yerbury, M.INST.C.E., M.I.E.E., M.I.MECH.E., who died on 13 July, aged 84, was in his early days chief assistant engineer for the electrification of the Bristol tramways. He was afterwards engaged with the Sheffield Corporation on the conversion of that city's tramway system from horse to electric traction, becoming chief engineer of the department. He was later deputy general manager of the Sheffield Corporation Electricity Department for 15 years, relinquishing that position in 1929 to become chief totalisator engineer for a firm which made and installed that apparatus.

Mr John Riley, founder of the Sheffield firm of John Riley and Son (Electrical) Ltd., died on 12 July, aged 83. Formerly electrical engineer of Cammell Laird and Co., at Sheffield, he left that concern in 1916 to found his own company, of which he became chairman. He was an early member of the Electrical Wholesalers' Federation, with which he was actively associated for many years.

Mr. R. Charles, until 1949 manager of the Leeds depot of the Simplex Electric Co., Ltd., died on 8 July, aged 69. He joined the former Credenda Conduits Co., which was later merged with Simplex, who he has continued to assist in a consultative capacity after his retirement.

Mr. T. E. Harris, C.B., C.B.E., M.I.MECH.E., M.I.E.E., deputy director-general of Ordnance Factories at the Ministry of Supply, died on 18 July, aged 61.

A memorial service to the late **Mr. E. E. Hoadley,** C.B.E., M.I.E.E., is to be held at the Queen's Chapel of the Savoy, W.C.2, on 27 July at 11.45 a.m.

I.E.E. Council and Chairmen

THE Institution of Electrical Engineers have announced the constitution of the Council, the various Sections, Committees, and the names of the chairmen of the Local Centres for the session commencing 30 Sept. next. These are as follows:

President: *Sir George H. Nelson,* BART., with two new vice-presidents, *T. E. Goldup,* C.B.E., and *Sir Hamish D. MacLaren,* K.B.E., C.B., D.F.C., LL.D., B.SC.

Honorary Treasurer: *The Rt. Hon. The Viscount Falmouth.*

Ordinary Members of the Council: *Prof. H. E. M. Barlow,* PH.D., B.SC.(ENG.); *C. M. Cock; A. R. Cooper,* M.ENG.; *B. Donkin,* B.A.; *Prof. J. Greig,* M.SC., PH.D.; *F. J. Lane,* O.B.E., M.SC.; *G. S. C. Lucas* O.B.E.; *C. T. Melling,* C.B.E., M.SC.TECH.; *H. H. Mullens,* B.SC.; *W. F. Parker; R. L. Smith-Rose,* C.B.E., D.SC., PH.D.; *G. O. Watson; E. L. E. Wheatcroft,* M.A.; and *R. T. B. Wynn,* C.B.E., M.A.

Associate Members: *A. T. Crawford,* B.SC.; *D. McDonald,* B.SC., *D. B. Welbourn,* M.A.; and *J. H. Westcott,* B.SC.(ENG.), PH.D.

Companion: *G. L. Wates,* J.P.

Associate: *J. Bennett.*

Chairmen of Sections: Measurement and Control, *W. Bamford,* B.SC.; Supply, *L. Drucquer;* Utilisation, *D. B. Hogg,* M.B.E., T.D.; and Radio and Telecommunication, *H. Stanesby.*

Chairmen of Local Centres for the next session are: North Midland, *F. Barrell;* Northern Ireland, *Major E. N. Cunliffe,* B.SC.TECH.; Western, *T. G. Dash,* J.P.; South Midland, *Lt.-Col. H. S. Davidson,* T.D.; Southern, *L. H. Fuller;* North Eastern, *D. E. Lambert,* B.SC.(ENG.); Mersey and North Wales, *Prof. J. M. Meek,* D.ENG.; East Midland, *F. R. C. Roberts;* North Western, *G. V. Sadler;* and Scottish, *E. Wilkinson,* PH.D., B.ENG.

Sections: On the Radio and Telecommunication Section Committee: the chairman is *H. Stanesby*; and vice-chairman, *H. S. McPetrie,* PH.D., D.SC.; and new Ordinary Members of Committee are: *F. S. Barton,* C.B.E., M.A., B.SC.; *A. J. Biggs,* PH.D., B.SC.; *W. Ross,* M.A.; *T. B. D. Terroni,* B.SC.; and *F. Williams,* B.SC.

For the **Supply Section Committee,** the chairman is *L. Drucquer;* two vice-chairmen are *P. J. Ryle,* B.SC.(ENG.); and *D. P. Sayers,* B.SC.; with new Ordinary Members of Committee, *J. A. Broughall,* B.SC.; *O. J. Crompton,* M.ENG.; and *C. P. Holder,* B.A.

The **Utilisation Section Committee** has as its chairman, *D. B. Hogg,* M.B.E., T.D.; and another vice-chairman, *J. Vaughan Harries,* with four more Ordinary Members of Committee; *R. H. M. Bartham,* B.SC.(ENG.); *J. M. Ferguson,* B.SC.(ENG.); *T. E. Houghton,* M.ENG.; and *H. G. Taylor,* D.SC.(ENG.).

The Measurement and Control Section Committee has *W. Bamford* as its chairman, with *H. S. Petch,* B.SC.(ENG.), a new vice-chairman, and three more members of the Committee: *J. Bell,* M.SC., *D. Edmundson,* B.SC.(ENG.), and *J. K. Webb,* M.SC.(ENG.), B.SC.TECH.

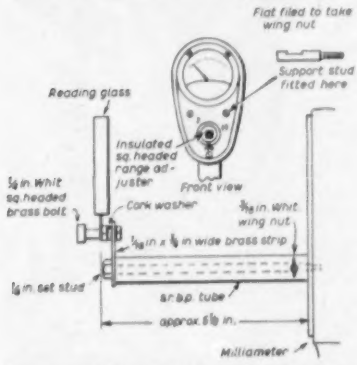
PROBLEMS AND PRACTICE

In Engineering

H.V. Testing Aid

WHEN carrying out h.v., d.c. tests, it had been considerably difficult to obtain an accurate reading on the milliammeter used in the test set. The difficulty lay in the combination of the smallness of the dial, its graduations and the necessity, on the grounds of safety, of placing the observer at least 4 ft from the instrument. When the m.a. reading was apparently nil, these circumstances prevented observers from determining whether the instrument was possibly faulty or its protective fuse open-circuited.

To overcome this difficulty, it was, as a first step, essential to magnify the dial in some way. To this end the device shown below was constructed and it has since proved itself extremely useful. Basically is comprises an ordinary metal rimmed magnifying glass, of 1¾ in. diameter, mounted about 5¼ in. from the dial, on the end of a 5 in. length of s.r.b.p. tubing 11/16 in. o.d. 7/32 in. bore. The glass was mounted on the tube by attaching it to brass strip fixed to the end of the tube itself. It was then possible to make a swivel joint between the glass and brass strip to enable the glass to cover the whole of the dial. Rotation of the glass is effected by turning the bolt attaching it to the strip, the head of this bolt being filed square so that the operator could use the special insulated rod supplied for turning the instrument range switch.



Arrangement for mounting insulated support for magnifying glass on instrument front

The rod was attached to the instrument front by using one of the five screws which normally hold the fibre front of the m.a. body. This screw was replaced by one specially made with a head of 3/4 in. length and 3/16 in. dia. on which a flat had been filed. A thumb-screw was fitted to the end of the tube to tighten on to this special screw, engaging on the flat portion.

From the point of view of magnification, the attachment works extremely well, giving clear readings of the dial at all distances up to 6 ft from the glass.

Every engineer has a story to tell; why not tell yours on this page? We welcome contributions to this feature, and those published will be paid for at our standard rates. Problems which are encountered and overcome in day-to-day maintenance or installation of electrical plant; useful methods and techniques developed for specific jobs, or current practices, all make instructive reading for others. We will also consider for publication problems requiring an answer. Sketches are often helpful and need only be rough, as they will be redrawn before use.

However, the device was found to have two other uses. Firstly, it provides a means of housing five spare fuses for the instrument, and secondly, it enables a somewhat crude, but effective, test of the instrument to be made before use.

The test set-up employs an additional modification to the tube, which is merely the insertion of a ¼ in. long 4 B.A. screw completely through the tube at about ¼ in. from the wing-nut end. This screw serves to retain the spare fuses within the tube bore. To provide a quick check of the instrument, a second 4 B.A. screw is inserted in the wall of the tube so that its head is spaced about 1/32 in. from the first screw. To the head of the second screw is soldered a piece of zinc sufficient to cover the head. Testing is carried out by connecting the zinc covered screw to the main terminal of the milliammeter, and the other screw to the instrument body, and, with the range switch in its lowest position, the two screwed heads are bridged with a fingertip moistened with saliva. If the instrument is in working order the somewhat crude primary cell so formed is sufficient to deflect the pointer through one or two divisions.—*E. A. Robbins.*

Shocks from the Water Tap

WITH reference to J.H.P.'s query (7 July issue) I would set his mind at rest by assuring him that a very good earth was achieved and that it was in fact tested. This query, however, highlights again the many and varied problems that occur in the earthing of installations and their testing. These are important because of the danger and not always easy to solve.

For example, I had a case where each installation of two semi-detached houses was earthed to the water main and the initial test proved satisfactory in both cases. However, a fire occurred in one of the houses and on investigation it was found that the gas pipe had a hole in it and the escaping gas had been ignited. The pipe was mounted on the kitchen wall alongside the water pipe and the edge of the saddle holding the gas pipe to the wall was touching the water pipe. The two pipes were not otherwise in physical contact.

In the house next door a fault to earth developed at a plug point. The leakage current passed from one house to the other via the water pipes and thence to the gas pipe via the edge of the saddle. Arcing took place at this point of contact causing a hole to be burnt in the gas pipe and igniting the escaping gas.

It will be observed that the damage was done in the house where there was a good installation which had not become faulty and where, to all intents and purposes, every precaution had been taken to prevent danger. In spite of this a fire occurred.

I have known similar cases in my experience (one other fairly recently where the gas and water pipe were in contact in the attic and a fire occurred) and would ask (*a*): how is it possible to avoid them simply by testing the earth when the contact can so easily be made after the electrical work is completed and connected to the supply, and (*b*): how many times is a good test only a good one because of such fortuitous contact which may be concealed from all normal inspection?—*J.H.*

Cable Economy

THE large volume of discussion on the above subject tempts me to make further comments on some of the ideas presented. Mr Satchwill's point that his four twin feeds and two single cables are less than my three twin and two triple cables appears correct, but in actual fact we are not so much concerned with the number of cores as the number of cable ends for connection. My form results in eight such ends with four stripped conductors entering the phase terminal of the 3-plate ceiling rose, which is quite enough; the other method gives ten cable ends with a cluster of five for the phase terminal.

I still find difficulty in appreciating the value of using single core cables. Apart from the inherent mechanical weakness, in comparison to the twin and 3-core types, there remains the odd occasion when, hurrying to get in before the plasterers, a single cable will get pushed into the conduit on its own. While I would concur that, "any electrician worth his salt would not surely resort to such practice," unfortunately we must recognise that many circumstances may permit this to occur. Therefore, why take a chance?

Again, I must admit extreme reluctance to fitting the hall and landing light on the same circuit. Home Office statistics reveal that a very large number of indoor accidents happen to people falling downstairs. Should a fuse blow while going downstairs, on the way out for the evening, after locking the top rooms, another injury may be added to the accident figures.—*M.N.*

(*This correspondence is now closed.—Ed.*)

Equipment for Industry

Corrosion and Heat Resisting Paint

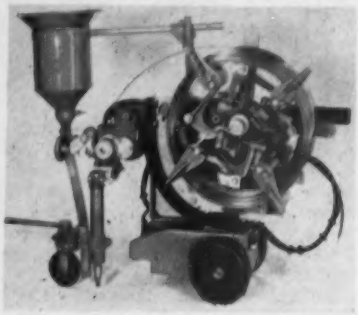
A NEW paint for the internal finish of transformer and switchgear tanks has been produced by GRIFFITHS BROS. AND CO. (LONDON), LTD., Macks Rd., Bermondsey, S.E.16. The paint is suitable for application by brush or spray and has an economical covering power of 720 sq ft per gallon. Hard drying time is sixteen hours after which it is claimed that the paint exhibits a high resistance to hot transformer or lubricating oils. The makers state that the only effects observed after continuous immersion for 450 hours in 50 per cent sulphuric acid at a temperature of 37° C were a slight discoloration and loss of gloss. This paint suitably described by the makers as Armour 1076/J may find many more uses in industry where surface insulation is necessary against acid corrosion and heat.

Erecting "off the road" Poles

IT is noted that the South of Scotland Electricity Board has received a mobile Earth Boring unit from S.M.T. SALES AND SERVICE CO., LTD., Edinburgh. This unit will be used almost exclusively for speeding up the erection of "off the road" poles supporting overhead lines. A hole 2 ft wide and 7½ ft deep can be drilled by the earth borer in about three minutes. A self-contained winch converts the machine into a jib crane for lifting and erecting the poles transported by the vehicle. Mounted on a 4-wheel drive Bedford chassis the Cheshire-Highway Earth Boring machine becomes a mobile unit. The Bedford body is specially designed and is heavily strengthened at the rear to take the thrust of the large jacks which steady the vehicle during drilling operations.

Expanding Reel for Wire Coils

CONTINUOUS welding processes use coils of welding wire which are invariably random wound and consequently are difficult to retain due to the tendency of such coils to expand as they unwind. To overcome this, QUASI ARC LTD., Bilston, Staffs, are offering a wire reel designed to expand with the coil. Its main feature comprise four spring loaded



Special expanding reel for holding random-wound coils of welding wire

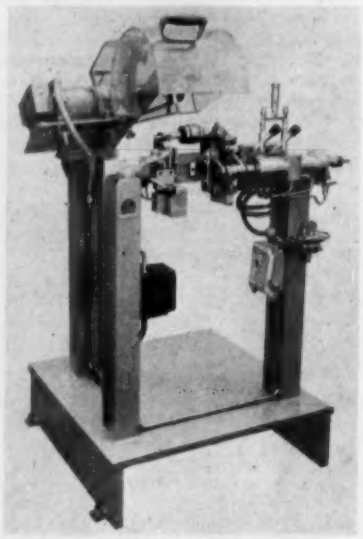
fingers which press against the internal diameter of the wire coil. The fingers themselves are mounted on bell cranks pivoted on the four spokes of the reel. The drum of the reel is formed from two semi-circular strips of spring steel against which the fingers exert pressure. Each finger is fitted with a radial arm which acts as a flange to retain the wire on the drum. By rotating the fingers through 180 degrees the reel is readily prepared for loading, whilst eccentric cams on the fingers enable the effective diameter of the drum to be varied by 2 in.

S.P. Miniature Circuit-Breakers

THE increasing interest in circuit-breakers has led DRAKE AND GORHAM WHOLESALE LTD., 77 Long Acre, London, W.C.2, to market a number of miniature circuit-breakers having a range of 6-25 A and for use up to 250 V d.c. and 415 V a.c. Smallest in this range is the DSL Dwarf Miniature having a push button action and a circular body which lends itself to an E 27 Edison screw plug base. The narrow width of 1¼ in. makes model KSL Midget Miniature suitable for mounting on meterboards, etc., where space may be limited. Connection and fixing are made from the front without removal of the cover. The final model in this miniature range is the robustly constructed ISL Industrial circuit-breaker for heavier duties. Mounting and connecting is made in a similar manner to the Midget Miniature. The makers state that back-up fuses are not necessary due to the short rupturing time; they also claim a high making and breaking capacity achieved by double break and de-ionisation chambers.

Cutting Small Commutators

THE conventional small motor commutator lathe supports the armature by shaft centres and employs a fixed cutting tool. However, in the case of the new lathe manufactured by SMALL ELECTRIC MOTORS LTD., Beckenham, Kent, the armature is supported by lightly oiled, tungsten carbide faced vee blocks and rotated by belt drive over the armature core. It is claimed that by turning commutators on their own armature journals perfect concentricity can be obtained and also obviating the necessity for clean-



The new lathe for small commutators

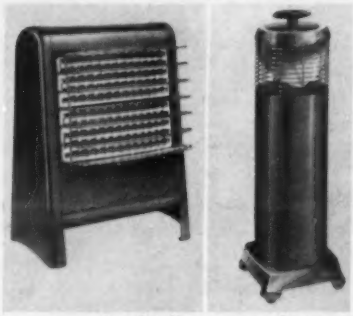
ing and truing the shaft centres. The machine caters for a maximum bearing diameter of 0·843 in. up to 12 in. between vee blocks. Operating time has been carefully considered since the machine employs a cutting tool of the self-retracting type which will cut in either direction and automatically resets to cutting position at the beginning of each cutting stroke. Starting is controlled by the safety guard which, when pulled down, engages a locking device permitting an automatic air driven system to start the motor.

S.M.T. produce this mobile earth boring tool for erecting poles for o.h. lines

Two M.E.M. Introductions

TWO additional heaters have been introduced by the MIDLAND ELECTRIC MANUFACTURING CO., LTD., Reddings Lane, Tyseley, Birmingham.

First is a new "Circulair" convector heater, a 7¼ in. square, 22¼ in. high vertical model loaded 1 kW and priced £4. 12s. 10d. inc. Purchase Tax. The heating element is entirely enclosed and the outer casing remains at a safe handling temperature. Heat is deflected by a plate at the top of the unit. A light at the base reflects a warm glow through the grille. Finished in bronze with black moulded "Memite" lifting handle, the unit weighs only 12¼ lb and is advocated for kitchen, hall and bedroom use.



The new "Circulair" convector heater is easily portable. "Memolo," left, is compact, simple, yet efficient

Second is "Memolo" a new flat bar type fire of compact and simple design. Sheet-steel construction for lightness and strength is part of the design for years of good service. The bar type heating element is shielded by a strong guard. Finished in mottled stone the "Memolo" is available in two sizes 1 kW at £2. 17s. 4d. and 2 kW £4. 0s. 7d. (with switching for full or half heat) inc. p.t.

TRADE PUBLICATIONS

A notice of a new publication by Davey Paxman and Co., of Colchester, in our 30 June issue made reference to a 7L range of diesel engines. This, of course, should be the "YL" range which includes the larger machines made by the Company.

FANS.—Recently published by Prat-Daniel (Stanmore) Ltd., Dalston Gardens, Stanmore, Middx., is their new general leaflet P.33 giving details of the fans and dust collectors.

CONDENSERS.—Latest T.C.C. technical bulletins issued by the Telegraph Condenser Co., Ltd., North Acton, London, W.3, are No. 46 low power ceramic transmitter condensers, Pot types CC168/T to CC171/T. No. 47, "Superlytic high quality electrolytic condensers," No. 48, "Subminiature tubular electrolytic condensers," No. 49, "Ceramic trimmer condensers for TV tuners." Whilst the No. 4 Special products bulletin gives details of printed circuits in the construction of the Mullard 510 amplifier.

EXCAVATORS.—Details of the Staffa-Bruneri mobile hydraulic excavator have been released by Chamberlain Industries Ltd., in leaflet form.

New "Mutac" Switchplugs have Pilot Lights

FLUSH and surface pattern switch sockets and plugs, embodying pilot lights, are being produced by the GENERAL ELECTRIC CO., LTD., Magnet Hse, Kingsway, W.C.2.

Both 13 amp and 15 amp versions are available employing a Mutac a.c. switch and 3-pin plug which in the 13 amp version is fused. They are housed in a cast iron box tapped with one ¾ in. e.t. hole and a brass front plate finished as standard in Florentine Bronze. Fitted below the switch dolly is the red pilot light which is a completely sealed unit housing a 200/250 V neon tube and resistor. The seal is effected by swaging the red lens into a brass bezel finished in bronze. The long life of the neon tube is claimed to render unnecessary any provision for lamp replacement. Units incorporating these pilot lights are of similar dimensions to existing "Mutac" sockets. Prices are £1. 12s. for 13 amp flush (S 4564/2959) and surface pattern (S 4566/2959) and £1. 11s. 8d. for the 15 amp version flush (S 4594/2886) and surface (S 4596/2886).

Hurseal Cosy Look Convector

RECENT addition to their range announced by HURSEAL LTD., 229 Regent St, London, W.1, is a new console convector heater.

Finished in light bronze stove enamel and measuring 30 in. x 24 in. x 6½ in. this attractive new model has three heat switching which also controls the internal ruby lamp giving appropriate light levels to correspond with heat output.

Hurseal's new convector has glow lighting to correspond with heat output

Open wire spiral elements loaded at 2 kW heat the air to 260° F which is deflected through the top grille by curved chromium reflector. Despite this temperature at the top does not exceed 160° F and 200° F at the front.

Maintenance is made easy by the provision of a front panel which when two securing screws are released swings forward to allow easy access to the elements, switches and lamp.

Price is £14. 19s. 9d. inc. p. tax.

For the Electrical Trade

Elga Kettle with New Connector

IN our reference to the provision of a new type kettle connector with Elga kettles we omitted to mention that these connectors are one of the products of ASHLEY ACCESSORIES LTD., Ulverston, Lancs, and are the subject of registered design 873403. The Ashley catalogue number is C 1107.

The Tarpentiller

LATEST of the labour saving gardening tools introduced by the TARPEN ENGINEERING CO., LTD., Ixworth Hse, Ixworth Place, S.W.1, is a power operated hoe. Specially designed for use in herbaceous borders, flower and rose beds and shrub borders where great accuracy of control is necessary the Tarpentiller employs a ½ h.p. motor to drive the tiller head. This has four high carbon steel blades with overload slipping drive. Each of the 6 in. blades has three teeth giving a total of twelve cutting edges. Capacity is 5 in. tillage width at a speed of 250 r.p.m. The Tarpentiller, which costs £35, is extended in application by the provision of a "Tarpensaw" chain saw attachment selling at £17. 10s. which has a patented "Chipper" tooth for free cutting. Maximum cutting length of the saw is 12 in. but recommended cut is 7 in.

Ideal for the keen gardener the Tarpentiller doubles as a chain saw

NEW LITERATURE

Textbook of Illuminating Engineering

by J. W. T. Walsh, O.B.E., M.A.(OXON.), D.SC.(LOND.)

WRITTEN at the request of the Illuminating Engineering Society, this book was primarily intended for students preparing for the C. and G. intermediate examination in the subject, but the present revised edition broadens the scope to assist students taking the subject of Illumination Engineering in Part III of the Final Examination of the I.E.E. To this end a new chapter on colour has been added, whilst extensive changes in nomenclature made in 1948 and 1951 by the C.I.E. have also been incorporated. First and foremost it still remains a textbook, but one which is particularly valuable to the student in Illuminating Engineering and which presents an erudite and clear exposition of both fundamentals and their practical application. Its initial chapters are concerned with the nature and production of lights, the laws it obeys and its effect on the eye. The subject is then developed to consider the theory and practice of light measurement, followed by a discussion on daylight, and light produced by combustion and by electricity. The consideration of the design of lighting installations covers the control of light distribution and the principles of design itself, with examples of lighting design, and chapters on the supply of energy for lighting and on colour, together with useful tables conclude the work. Second edition, published by Pitman, 202 pages, 8½ in. by 5½ in. Price 28s.

Fundamentals of Radar

by S. A. Knight, F.R.S.A.

AS its title suggests, this little book is a basic survey of the principles underlying radar, and as such deserves the particular attention of service personnel concerned with the operation or maintenance of radar equipment and students of radio and television. Such is its logical approach and non-mathematical technique, however, that anyone, from the radio amateur to service engineer, who has had experience of radio work will find this book well worth reading if their desire is to learn something of radar. Its present edition sees some revision of the original text, the addition of a new chapter on waveguides, and the expansion of other subjects. The book is not, nor does it purport to be, a treatise on the subject dealing extensively with complete radar systems. It describes the basic principles underlying the operation of radar, developing to discuss in outline circuits evolved for producing the requisite pulses and other voltage waveforms, cathode ray indication, pulse transmitters and receivers, and the transmission and radiation systems used. Second edition, published by Pitman, 150 pages, 7½ in. by 4½ in. Price 15s.

Transistors and Crystal Diodes

by B. R. Bettridge, A.M.BRIT.I.R.E.

APPLICATION is the keynote of this instructive booklet, which, in the words of its subtitle, is concerned with the "what they are and how to use them" of the subject. To this end the book is consistently businesslike, as befits any literature, such as this, which is addressed primarily to the home experimenter, and which presents him with not only a useful guide to transistors at present on the market, but also a number of practical circuits to enable him to work with them himself. From the opening chapters concerned with an explanation of the operation of diodes and transistors, the book quickly gets down to giving circuits. It deals with transistor circuitry in general and in particular cases for point-contact types. Junction transistors are dealt with somewhat less fully, the fewer types available obviously restricting the extent to which practical circuits can be described. Published by Norman Price (Publishers) Ltd., 72 pages, 8¼ in. by 5½ in. Price 5s.

Alternating Current Machines

by A. F. Puchstein, T. C. Lloyd and A. G. Conrad.

NOW in its third edition, this somewhat bulky volume provides, within one cover, almost all required by the student of alternating current machines and the fact of its being American hardly detracts from its value this side of the Atlantic. The revision undertaken for this new edition has not greatly changed the form of the work, with its emphasis on the principles and theories of operation serving as a medium for developing what the authors describe as "engineering disciplines." Most of the changes are seen in approaches to the theories of certain machines, together with additional material on variable speed drives, rectifiers, and self-synchronous machines. Its study is intensive, conforming to a common pattern for each machine by considering its construction, operating characteristics, and their calculation from tests and various related phenomena. It ranges thoroughly over transformers, alternators, and motors of the poly phase induction and synchronous types. Other subjects include alternators in parallel, synchronous converters, mercury arc rectifiers and s.w.p. commutator and repulsion motors. Third edition, published by Chapman and Hall, 721 pages, 9 in. by 6 in. Price 68s.

Control System Dynamics

by W. R. Evans.

SO many factors are involved in the correct operation of closed loop control systems, whose application in industry has been given added impetus by the current interest in the "automatic" factory, that their analysis can be materially affected by the analytical procedure employed. To assist the designer in his choice of technique comes this masterly book, which is particularly valuable in providing an exposition of the root-locus method developed by its author. Moreover, its approach and treatment of the subject of control system analysis merits it a place on the bookshelf of the student intending to specialise in industrial control technology. Its scope is wide, ranging from the problem of determining the change in speed of a motor to a suddenly applied voltage to the interaction of the roll and yaw motions of an aircraft. Initially, the book discusses the dynamics problem, considering the basic form of control system and problems involved, developing the theme to cover typical components, the fundamentals of transient response and transfer functions. Methods of analysis are then considered —frequency response and root-locus procedures—continuing with a discussion of multiple loop systems, circuit analysis, and the use of determinants. Concluding chapters are concerned with transfer functions applied to transient response and graphical analysis of non-linear systems. Published by McGraw-Hill, 382 pages, 9 in. by 6 in. Price 52s.

BOOKS RECEIVED

Questions and Answers on Radio and Television, by E. Molloy. Present edition enlarged to cover recent important advances in radio and television techniques, including the new Band III frequencies. Fifth edition, published by Newnes, 148 pages, 6½ in. by 4½ in. Price 6s.

Practical Wireless Service Manual, ed. by F. J. Camm. Revised edition incorporating instructions for building testing apparatus. Tenth edition, published by Newnes, 284 pages, 7½ in. by 5½ in. Price 17s. 6d.

Protective Current Transformers and Circuits, by P. Mathews. Direct appeal to current transformer designers and protection specialists in both manufacturing and supply industries. Published by Chapman and Hall, 253 pages, 8½ in. by 5½ in. Price 36s.

Analysis of Feedback Control Systems, by R. A. Bruns and R. M. Saunders. Of value to both engineers and students, giving thorough treatment of components and systems. Published by McGraw-Hill, 383 pages, 9 in. by 6 in. Price 53s. 6d.

Electronique Industrielle, by G. Goudet. In French, details basic elements of electronic circuits and tubes, progressing to discuss specific industrial applications. Published Editions Eyrolles, 61 Boulevard St. Germain, Paris Vième, 635 pages, 9½ in. by 6½ in. Price 5,500 fr.

NEWS OF THE WEEK

New Qualification for Engineers

DIPLOMA IN TECHNOLOGY TO BE ESTABLISHED

A NEW qualification is likely to be introduced into engineering circles before long. This is the effect of the decision of the Minister of Education, announced last week, to establish a Council responsible for making national awards in technology in technical colleges. Such a move was recommended in 1950 by the National Advisory Council on Education for Industry and Commerce, but then a body to be known as The Royal College of Technologists was proposed. The scheme now adopted will do away with much of the cumbrous organisation attaching to the original proposal. Diplomas for technology will be awarded by the Council, but it will not conduct examinations itself. The Council will have five members, appointed by the Minister, and it has been announced that Lord Hives, Chairman of Rolls Royce, will be the first Chairman. The Council is to set up two boards of studies, one in engineering and one dealing with other technologies.

The boards of studies will be responsible for all matters of curricula, equipment of colleges, standards for admittance to courses, and of teachers. On behalf of the Council, they will approve technical colleges and their courses as appropriate for the award of diplomas in technology.

The proposals of the N.A.C.E.I.C. have been for some time opposed in many respects by the senior engineering institutions. In the last annual report of the I.E.E. it was stated that three principal points still separated the Advisory Council recommendation from what the Institutions were willing to accept. These were as follows:

(1) At the outset only a small number of colleges in which the necessary standards could be assured should be recognised for the new courses and awards and that the present limited teaching resources should be concentrated in them. (2) That the control of conditions leading to the new award should be in the hands of those who were professionally qualified to adjudicate. (3) That the award in engineering should have a title which was readily distinguishable from that used for secondary technologies, to avoid the risk of confusing the public by the existence of varying academic standards.

Sites for Nuclear Stations?

SITES in Essex and near Bristol are being surveyed for the first two of the C.E.A.'s nuclear power stations, we understand. The Essex site lies between the rivers Crouch and Blackwater, and is within easy reach of the Rayleigh substation. The other is in the Severn Valley, near Avonmouth. In both cases borings have been taking place to test the subsoil.

PAYING FOR HIGHER PRICED COAL

THERE was a net surplus of £8 millions by the Central Electricity Authority for the year ending 31 Mar. last, it was revealed at last week's meeting of members of the Authority and the chairmen of the Area Boards, when a statement on the effect on tariffs of the increase in coal prices was made. In this it was pointed out that it had been hoped to carry the extra 9 millions a year on wages and salaries and £3¼ millions on freight charges, but the higher coal prices made it essential to raise all tariffs.

The Eastern Electricity Board, however, hope to avoid an increase at the present time, as their tariffs in force since April included an allowance for a probable increase in coal prices. But Mr S. F. Steward, chairman of the S. Western Board, considers some tariff increases are inescapable, and this is the attitude of most of the Boards, many of which are submitting proposals at their next Consultative Council Meetings. The Federation of British Industries has registered "a very strong protest" at the latest coal price increases. In its letter to the N.C.B. the Grand Council of the F.B.I. maintains that the increases, introduced suddenly, will not only handicap competitive power in the heavy fuel and power using industries, but will entail substantial losses on existing contracts. Basically the fault is the Board's failure to get more coal—a 2% increase in productivity would avoid the shortage over recent years, it is claimed.

Opposition to Welsh Board

The formation of a Welsh Electricity Board would be a retrograde step, in the opinion of the Rev. H. Glynne Jones at last week's meeting of the Ruthin Rural Council. He asked that council to protest strongly against the constitution of bodies asked to give evidence before the Herbert Committee (which we reported last week). He alleged that a Welsh Electricity Board would put the clock back 20 years so far as the electrification of North Wales was concerned, and challenged the statement made at the inquiry by representatives of the New Wales Union that there was a large volume of opinion in Wales in favour of one electricity board. Two years ago the Welsh Association of Local Authorities decided almost unanimously to reject the proposal, he said. After another speaker had put an opposing view the Council decided that the resolution to protest be deferred until the September meeting.

Trained Stokers—Solution to Fuel Costs Problem

FULLY trained boiler operators and stokers are the solution to the problem of increased fuel costs in the opinion of Sir Leslie Hollingshurst, chairman of the National Industrial Fuel Efficiency Service.

Commenting on the recent coal price increase, Sir Leslie thought that this was a challenge which industry could afford to accept. Few works in general industry could not reduce their fuel consumptions by between 15% and 20%—a saving which would offset the rise.

N.I.F.E.S. was increasing its engineering staff and were ready to accept additional work all over the country but the surest way to quick savings was to ensure that stokers and boiler operators were properly trained to City and Guilds certificate level. Training at technical colleges was readily available where Boiler Operators Certificate Courses had been arranged. If this couldn't be arranged N.I.F.E.S. was prepared to bring training to the operators with practical instruction on site and backed by home study material for the C. and G. I. Boiler Operators Certificate. Sir Leslie called for the help of industrial organisations in providing space for meetings of operators, N.I.F.E.S. would provide instructors.

CADMIUM POISONING

WHETHER or not cadmium poisoning can be considered a "prescribed disease" under the Industrial Injuries Acts and if so for what occupations Industrial Injuries benefits can be claimed for acute cadmium poisoning, are matters now under consideration by the Industrial Injuries Advisory Council.

They are investigating whether prolonged exposure to cadmium at work can cause chronic ill-health against which insurance cover should be provided. Organisations and individuals concerned are invited to submit written evidence to the Secretary, Industrial Injuries Advisory Council, 10 John Adam St, London, W.C.2, to reach there by 23 Aug. Explanatory memoranda are available.

Battery Rail Car Experiments

IN the course of debate in the House of Commons, the Parliamentary Secretary to the Ministry of Transport said that the North of Scotland Hydro-Electric Board had quoted a price of 2·1d. for recharging batteries (see page 111). Mr Tom Johnston, Chairman of the Hydro-Electric Board, has since stated that this information is "especially mysterious" as the board's published tariffs for charging batteries for vans and other road vehicles is 1·2d. per unit.

The Hydro-Electric Board, continued Mr Johnston, have never been asked to give a price quotation for an experiment, or if the experiment be successful, a price for continuous running thereafter. What they had done is to urge repeatedly the desirability of an experiment with a battery driven rail car on a branch line. The details of co-operation in such an experiment they were willing and anxious to discuss with the British Transport Commission at any time.

Seen here is the German battery rail car which has been under discussion in the House of Commons recently. It is stated in "World Railways" that the rail car can travel 280 miles with one charge of its 19·6 ton battery and attain a maximum speed of 56 m.p.h. Manufacturers are Wegmann and Co.

H.P. Restrictions cut Gas Trade

THE RE-IMPOSITION of hire-purchase control seems to have hit the gas industry harder than the electrical industry according to usually-reliable sources.

Probably due to the fact that the major proportion of gas appliances are sold through the area gas boards who had been offering long-term low deposit hire-purchase arrangements, gas appliance sales fell 30% to recover and stabilise over the last two months at around 20% below last year's levels.

The electrical industry has fared better, apart from cooker sales, which have dropped about 15 to 20% mainly for the same reason as the gas appliances. Refrigerators, washing machines and vacuum cleaners until very recently seemed unaffected although the market appears to be hardening at the moment.

May deliveries of refrigerators were a record but June figures are expected to be over 20% below June last year.

Motors for New Tube Trains

LONDON TRANSPORT has ordered, from the General Electric Co., thirty-two 575 V traction motors to equip three prototype tube trains of steel construction with aluminium panelling and incorporating rubber in the suspension. Generally similar to the LT100 design of which G.E.C. has supplied 923 to London Transport, these motors will be slightly smaller and lighter. They will be self-ventilated four pole machines with roller armature bearings and roller bearings in the axle-suspension sleeve. Transmission will be through Wiseman gears with a ratio of 18/65. The three trains comprise 21 cars of which fifteen will be motored—one motor in each bogie. Motors will have the rating of approximately 115 h.p.

11th Ayrshire Showroom

A NEW service centre—the eleventh in Ayrshire—was opened in the Central Arcade, Ayr, last week by the South of Scotland Electricity Board. At the opening ceremony, Mr A. E. Roots, the Board's Ayrshire area manager, said that when the Board took over in 1948 some 897 Ayrshire farms had electricity. Now 2,043 farms were being supplied, and that had been done at a cost of over £850,000. The Board hoped that by the end of 1957 every farm in Ayrshire willing to have electricity would have it installed.

OFFICIAL PUBLICATIONS

ELECTRICITY ACT, 1947. Statement of guarantee by Treasury on loans of the C.E.A. H.M.S.O. 2d.

HYDRO - ELECTRIC DEVELOPMENT (SCOTLAND) ACT, 1943. Statement of Guarantee by Treasury on loans of the South of Scotland Electricity Board. H.M.S.O. 2d.

BRITISH STANDARD, B.S. 2727, 1955. Wrought aluminium for electrical purposes.

MEXBOROUGH TENANTS PREFER ELECTRICITY

REPLIES to questionnaires sent to applicants on their waiting lists for council houses by Mexborough U.D.C. indicate a majority preference for electric cooking. Questions asked were mainly of a personal nature but a note was included to the effect that "All new houses built by the Council are provided with a solid fuel cooking range. In the event of an additional source of power for cooking being fitted state whether you would prefer gas or electricity." An analysis of the returns showed that 536 of the 978 applicants questioned wanted electricity, 283 were undecided and only 219 preferred gas.

The council interpreted this as being 22% only in favour of gas and decided that this was not sufficient to justify the provision of gas supplies in new council houses and all future housing will have only electricity installed. The East Midlands Gas Board has informed the council that nevertheless they will continue to lay gas mains on future council housing estates in Mexborough.

Sword of Honour for Technical Cadets

THE AIR COUNCIL has approved the annual award of a Sword of Honour to the Technical Cadet of each senior entry at the Royal Air Force Technical College, Henlow, who on passing out is recommended as having most distinguished himself in study, sport and general influence. Henlow thus falls in line with Cranwell where the Sword of Honour is awarded to the best all-round flight cadet.

First presentation of the Sword of Honour will be made tomorrow.

Designed to burn the "slurries" and "filter cake" produced when coal is cleaned at the washeries, Barony power station (right) is now beginning to take shape. It will burn this low-grade fuel obtained from the adjacent colliery, the headgear of the No. 3 shaft of which is shown on the left, and from the nearby Killoch Pit. A project of the C.E.A., in collaboration with the National Coal Board, the power station will have two 30 MW sets and four 150 klb/hr boilers

4th Year Schoolboys Introduced to Engineering

CATCH them young seems to be the motto of South Wales Switchgear Ltd., who have taken the unusual step of providing two separate one-week vacation courses at their Blackwood Works expressly for boys in the 4th year of their Grammar School education.

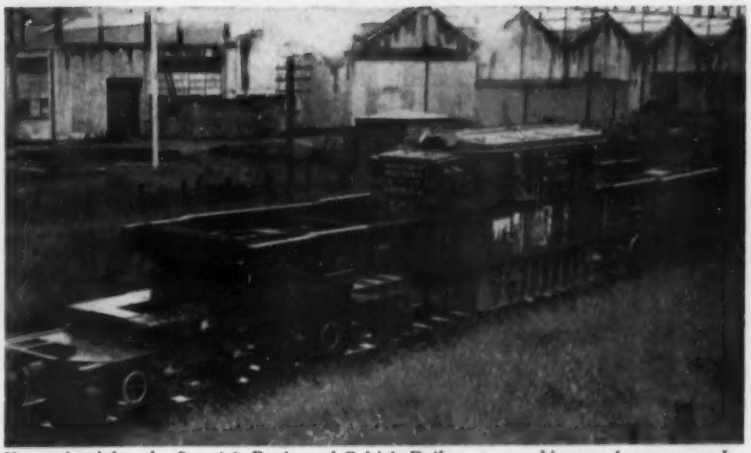
Object of this careers scheme is to introduce the boys to engineering prior to their completing their grammar school education. The courses will be run for a week commencing 18 July and 15 August. On the last day of the final week, i.e., Friday, 19 August, there will be a number of educational and industrial heads present when a general discussion will be held to answer any of the boys' queries.

S.T.C. get large Burma Order

EQUIPMENT to set up a new overseas radio telephone and telegraph centre in Rangoon worth £125,000 has been ordered from Standard Telephones and Cables Ltd. by the Government of Burma.

The new stations will provide Burma with a direct public r/t link with London and both r/t and telegraph circuits to Madras in India and help put Burmese telecommunications on a par with other modern international systems.

The order includes D.S.13 and D.S.12 single-sideband transmitters of 40 kW and 4 kW power respectively, RX9A single sideband receivers, RX5B radio telegraph receivers, terminal and privacy equipment teleprinters and beam aerials.



Heavy load for the Scottish Region of British Railways was this transformer sent by Bruce Peebles and Co. from Staleford Yard, Edinburgh, to Spean Bridge, Inverness, for the North of Scotland Board's Garry-Morriston project. Total weight of the transformer was 64 tons and dimensions 23 ft 9 in. × 11 ft 7 in. × 9 ft wide. The journey was accomplished in 14½ hours

Transfer Telephones to Public Utility Corporation say T.E.M.A.

REVIEWING post office organisation in the first of a series of annual reports, the Telecommunications Engineering and Manufacturing Association criticises the present constitution of the telephone service as a function of the Post Office and advocates its transfer to a public utility corporation.

Long term planning due to the difficulties of finding building sites for exchanges and the complicated and extensive underground cable system, is an essential factor in telephone service development but says T.E.M.A. "economic crises take place without warning and an attempt by the Treasury suddenly to cut down capital investment, for example, has very serious consequences on the ordered extension of the system." Attributing the present difficulties confronting the system to restraint shown in recent years on capital investment, T.E.M.A. finds that it cannot avoid the conclusion that "whilst realising the ability shown by the Post Office staff that a public utility corporation more remote from Government financial control would enable the business to be run more efficiently than is possible with the present system."

U.K. Appliance Display en route for Toronto Fair

FEATURE of the "Modern U.K." stand at the forthcoming Canadian National Exhibition in Toronto (26 Aug.–10 Sept.) is the series of display windows devoted to such subjects as pottery and glass, cutlery, tableware, household equipment, kitchenware and the like.

These displays are representative of the wealth of well designed goods with which Britain is attacking world markets. Goods shown have all been chosen from the C.O.I.D. pictorial card index of well designed goods "Design Review." The selection was made by the Council of Industrial Design on the request of the Board of Trade and includes a large proportion of electrical appliances. The selectors have chosen equipment which they believe will meet with great demand in Canada. To ensure their suitability C.O.I.D. sought the opinions of London representatives of Canadian buying houses at a preview in London earlier this year. Kitchenware and domestic appliances selected include Hawkin's LGH.666 automatic electric kettle, Dimplex's B.48 radiator, the Kenwood A.700 "Chef" food mixer, Russell Hobbs C.P.I. automatic electric coffee pot, a Bescol "Elephant" 208 electric kettle and Bulpitt's porringer 1204 and casserole 1105. There are to be four examples of electric light fittings and approaches have been made in this connection to George Forrest Ltd., W. S. Chrysaline, Oswald Hollman and Hiscock Appleby and Co.

There is already a great demand from Canada for fine traditional products. The "Modern U.K." display is designed to encourage a demand for our fine *modern* products.

The First Half-Century

The final paper of the I.M.E.A. Conference was presented by Mr A. R. Sillar, of Colchester. Its title was "Electricity Supply by Free Wiring and Prepayment Meters." The problem considered is the supply to small consumers, such as artisans and shop assistants, who, having electric light at their work, know its benefits and the carrying of the competition with gas down to the smaller dwellings. The Corporation does not do any free wiring direct, but through the local contractor. He points cut the prevalent defects of prepayment meters, especially the liability of the coin to stick, whereby the consumer gets his current for nothing describes his method of meter reading and collecting, and concludes with some tables showing a net profit per installation cf 8s. 2d.—*From our issue of 20 July, 1905.*

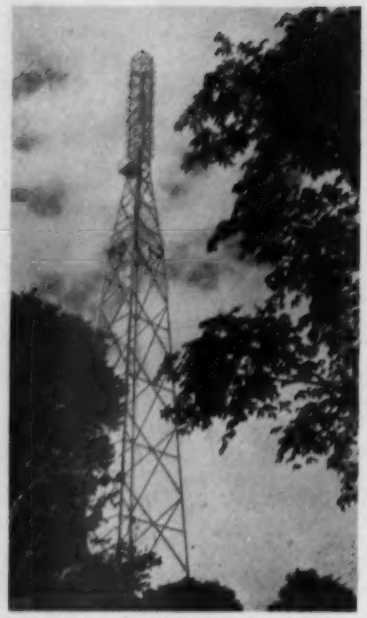
Architects see First West Country Floor Warming

THE first installation of electric floor warming in the West Country which is now being laid in the new Bedford St. Exeter service centre was inspected by invited groups of architects last week.

This installation of the "Panelec" system covers a floor area of 3,000 sq ft and has a total loading of 29·85 kW. It is designed to maintain an internal temperature of 55 degrees Fahrenheit against an outside temperature of 30 degrees despite normal ventilation throughout. Annual usage of energy is estimated as 41,000 units which, consumed during the period of 7 p.m.-7 a.m., should cost about £163 or 1s. 1d. per sq ft per annum.

Radio Speeds Road Services

SPEED-UP in British Road Services, London parcels collection is aimed at in the inauguration of two-way radio telephone between the parcels vans and the tranmitting station at Waterden Rd, Stratford, E. Other B.R.S. depots are linked by land line with the Stratford transmitting station. Pye Telecommunication supplied the equipment for London and for similar networks in Leicester, Bristol, Birmingham and Liverpool.



The mast and aerial of the new Croydon transmitting station of the Independent Television Authority. Installation of the Marconi sound transmitter is virtually complete and the vision transmitter will follow shortly

Paying for Road Lights

THE serious plight of some smaller local authorities faced with the responsibility of lighting trunk roads, was referred to at a recent meeting of the Durham City Council. It was decided to ask the Association of Municipal Corporations to consider the matter. Councillor W. F. Edge, said that for some parishes the cost of putting up a single trunk road light was more than a penny rate produced.

NEW HOMES FOR OLD

NEW E.D.A. publication sums up the potentialities and economics of rehabilitating existing housing. "Electricity a power of good for improvements and conversions," emphasises the economy of cost and labour afforded by electricity in the provision of vital cooking, heating and power services.

A.E.I. Stockholders Visit Rugby Works

SECOND visit in recent months to the Rugby Works of British Thomson-Houston was made by a party of 200 A.E.I. stockholders. Special trains brought them from London and the Midlands to the Works where they saw work in progress on overseas contracts. B.T.H. have in hand contracts for 60 MW sets for Meaford "B," second of six 30 MW turbo-alternators for Goldington, 30 MW sets for Wallerawang N.S.W. and Tallawara, N.S.W., and two 66,667 kVA 150 r.p.m. waterwheel alternators for Eildon Power Station, Victoria. Later the party visited the Mazda lamp factory and the Research Laboratory.

Higher Technology Studies

DETAILS of special courses in higher technologies in engineering, science, management studies and commerce, available at schools and colleges in the session 1955-1956, have been published as a bulletin by the London and Home Counties Regional Advisory Council for Higher Technological Education. Part I refers to courses available in the Autumn Term of 1955.

ACCIDENT ON O.H. LINE

ONE man was killed and seven other employees of the Midlands Electricity Board were seriously burned in an accident at Brailes, near Banbury, last week. The men were engaged on erecting a new 11 kV line. An official of the Board stated that the supply had been disconnected and earthed and the men were getting an extra line between poles by means of a winch. The winch jammed and the jerk necessary to free it caused the line to spring upwards and strike the 66 kV main transmission line which crossed above the 11 kV line.

Rheostatic Overseas Agents See New Works

TWENTY delegates representing firms associated with the Rheostatic Company and agents from fourteen countries overseas took part in the company's second international conference and later visited the new buildings at Slough and Frimley.

Programme of the conference included papers on technical subjects dealing with applications and developments of the firm's products and a visit to London Airport, where they saw the heating installation automatically controlled by Satchwell instruments and control panels.

Ambassador sees Lighting Exhibition

H.E. the Danish Ambassador, H. V de Steecusen-Leth paid a visit to the exhibition of contemporary and traditional lighting fittings which is being held this week at the Mostyn Hotel, London, W.1.

Second exhibition to be held in this country by the Danish firm, H. A. Grubert's Sonner, the display will be moved on Saturday to the Grosvenor Hotel, Manchester, for a two-day stay and then to the St. Enoch Hotel at Glasgow.

Mr Paul Grubert is exploring the market for his firm's range of fittings (see ELECTRICAL TIMES, 19 May, p. 847). After his Scottish visit Mr. Grubert will visit Scandinavia, returning in Oct. to the U.K.

Assisted Wiring Suggested in Lancashire

SUPPORT for existing plans in London proposing a national assisted wiring scheme, has come from Lancashire. Ald. A. P. Derrick told the Preston district committee of the N.W. Electricity Consultative Council that many people buying a house had been asked by the Board to have the house rewired, and they just could not afford it. The Area Board is to be asked to consider the institution of an assisted wiring scheme.

Crypto Rebuild

FIFTY PER CENT increase in floor-space is expected when the rebuilt works of Crypto Ltd. are completed next spring.

Crypto Ltd., a Lancashire Dynamo Group company, is rebuilding its works in North Circular Rd, London, in four phases to avoid interference with production. Rebuilding will entail an expansion in works space, an additional office block and a new canteen. The first section has already been completed.

NEWS IN BRIEF

New date of the annual dinner of the Cromptonian Association is now Friday, 30 Sept. Due to be held on 3 June, the dinner was postponed on account of the railway strike.

Despite the dispersion of factories Telcon annual sports meeting at Kidbrooke was well attended. Contingents came from Crawley, Farnborough, Kent, and Erith to see the Greenwich Works General Office win the Sir Geoffrey Clarke Challenge Cup with Engineering and Plastics Division tying for second place.

E.I.B.A. S.W. Area Golf Trials were held at Telverton, Devon, recently. Winner and runner-up respectively of the Medal Trophy were Messrs A. H. Warren and F. C. Rowse.

British Central Electrical Co., Ltd., went to Brighton for their annual outing.

Contract for the 560 ft stayed mast for the B.B.C's television and VHF transmitting station at Blaen Plwy, Cardiganshire, has been placed with J. L. Eve Construction Co., Ltd.

Metropolitan-Vickers Electrical Co. have offered to equip completely four of the advanced laboratories in Salford Royal Technical College extensions as a token of gratitude for the training of many of its technicians.

Kelvin and Hughes echo-sounders and the Accelerometer are playing a large part in Donald Campbell's new attempt on the world water speed records now held by America.

Philips sound reproduction equipment has been installed at the new Paulsgrove factory of Smiths Potato Crisps Ltd., Portsmouth. Similar equipment is already in use in 14 of Smith's factories in this country.

Northmet sub-area of the Eastern Electricity Board held their annual sports meeting at Winchmore Hill recently The Hertford Club repeated their 1954 success by winning the Shield awarded for the highest number of points.

Electric wall-panel fires are to be fitted in dining room recesses of 80 council houses on the Mountfield estate, St. Mary Cray, Kent. Petition to the council asked for improved heating arrangements.

QUESTIONS IN PARLIAMENT

Coal Supplies

POWER stations in Great Britain used 41¼ million tons of coal during the 12 months ended 30 June last, said Mr. Geoffrey Lloyd, Minister of Fuel and Power last week. Three millions of this had to be imported. The power stations may use nearly 44 million tons in the following 12 months. Suggestions were made that the C.E.A. should import its coal directly at world prices, and Mr Palmer asked if the Minister were aware that the C.E.A. were quite prepared to buy coal from overseas at world prices. The Minister replied that he thought that the prices should be averaged, and that the N.C.B. should be the importing authority.

Kipper Curing

IN answer to a written question, Mr Bevins, Parliamentary Secretary to the Ministry of Works stated that experiments on a small scale had been made at Torry Research Station of D.S.I.R. on an electrostatic method of curing kippers. This had showed promise of a substantial saving of time compared with the process now in use. It was hoped to try the new method on a factory scale next year, and that the result would be a more palatable kipper.

Technical Colleges

SIR David Eccles, Minister of Education, said last Thursday that the Government had accepted the recommendation of the National Advisory Council on Education for Industry and Commerce, to establish a Council responsible for making national awards in technology in technical colleges. Further comments on this move will be found on pages 75 and 107.

Monopolies Proposals

IN the course of a debate on the recent Monopolies Commission report on collective discrimination policy last week, the President of the Board of Trade gave an indication of intended Government action on the report. He said that the Government intended to take power by Act of Parliament to require registration of restrictive practices from time to time specified. Not all restrictive practices would be required to be registered at once. As in Sweden, certain practices would be selected, and included in those for early registration would be the practices referred to in the report. However, at an early stage agreements fixing common prices would also be included.

With regard to practices referred to in the Monopolies Commission report, once the registration authority had called forward for registration particular classes of agreement, then if firms wished to operate an agreement in this class they would have to register. Then the tribunal which will be set up for handling these matters, with the information that the register makes available, would call upon the firms concerned by given date to make out their case for employing that particular practice.

The President of the Board of Trade emphasised that the firms concerned would have the onus of seeing that the practice is in the public interest in their particular case.

Later in the debate the Attorney-General stated that the tribunal's function would be different from that of the Monopolies Commission now set up. The Monopolies Commission at present has to find out all the facts covering the whole range of an industry. Under proposed regulations, certain agreements would be registered, and the information would be available before the tribunal. He thought that Government proposals would act more swiftly than those contained in the majority report of the Monopolies Commission.

Office Safety

ANSWERING a series of questions on the possibility of legislation to give effect to the Gowers report on health, welfare and safety in offices, catering establishments, etc., the Secretary of State for the Home Department, Major Gwilym Lloyd-George said that a Bill was being prepared, and would be introduced as soon as time could be found for it. Shops, offices and other non-industrial employments would all be covered in one Bill. The Bill would not appear in the present Session.

Solid Fuel Appliances

THE Minister of Fuel and Power told Mr P. Noel-Baker last week that it was not yet possible to devise standards for domestic solid fuel appliances based on room efficiency.

Battery Rail Cars

IN the course of an adjournment debate last week the Joint Parliamentary Secretary to the Ministry of Transport and Civil Aviation, Mr Hugh Molson discussed the use of battery electrical rail cars on Scottish branch lines. He said that the facts and figures tended to show that battery rail cars were not normally any more efficient than light diesel vehicles. This is due to the high weight of the battery as compared with the weight of the vehicle. The battery rail cars needed for one branch line cost £50,000, because they had to be built of a specially light alloy on account of the weight of the batteries. Such vehicles were only comparable in efficiency with diesels providing that they could be recharged at a cost of not more than ¾d. per unit. The North of Scotland H.-E. Board had quoted 2·1d. per unit for recharging. However, the Transport Commission was prepared to undertake experiments with such cars provided that the North of Scotland H.-E. Board contributed to the cost, and was prepared to agree that if the experiments were satisfactory, it would continue to recharge batteries at ¾d. per unit.

Earlier in the debate Sir Robert Boothby had suggested that serious consideration should be given to the E.T.A. 176 rail car, which was produced in Germany in 1952. These, he suggested, had been most successful in operating at low cost.

Hire Purchase Figures

RETAILERS and finance houses are to be invited to co-operate in supplying statistics which will show the monthly change in hire-purchase sales and debts outstanding for the main type of goods, Mr P. Thorneycroft stated last week. It was hoped to start collecting the figures in the autumn.

Later, Mrs Mann alleged that in certain instances hire-purchase traders were offering goods under terms advertising no deposit and the public were being misled into thinking that the goods were being sold by hire-purchase. Mr Thorneycroft pointed out that there might be some confusion between agreements for hiring and those for hire-purchase. The Board of Trade could not compel buyers to read the agreements which they signed.

Valves and C.R. Tubes

THE President of the Board of Trade was asked whether, as radio wholesalers carried on restrictive practices affecting the supply and distribution of radio valves, and tubes, etc., he would add to the terms of reference of the Commission now investigating radio valves and tubes a requirement to investigate to restrictive practices of that trade?

In reply, Mr P. Thorneycroft said that the reference before the Commission covered all aspects of the supply of electronic valves and c.r. tubes.

Bank Overdrafts

WHEN Sir H. Butcher asked the Chancellor of the Exchequer whether he would now take steps to ensure that the nationalised industries made an issue of stock in order to repay their bank overdrafts and so enable the bank to discharge their responsibilities to private enterprise, Mr R. A. Butler, repeated that stock issues would take place at the appropriate time, but the repayment of overdrafts by nationalised industries did not mean that bank credit would become freely available to other borrowers.

C.E.A. Statistics

MR. NABARRO, on Monday last, asked the Minister of Fuel and Power for details of the annual investment, year by year, in the Electricity Industry since vesting day, 1 Apr, 1948; the average annual load factors of power stations in each year down to the year ended 31 Mar., 1955; and the annual investment authorised for each year forward to 1958

in respect of the Electricity Industry. Replying, Mr Geoffrey Lloyd said the annual capital investment by the Central Electricity Authority and Area Boards from 1948 to date was as follows: 1948-49, £95 millions; 1949-50, £117·2 millions; 1950-51, £128·6 millions; 1951-52, £141·7 millions; 1952-53, £153·8 millions; 1953-54, £169·8 millions; and 1954-55,£202·9 millions (provisional). The average load factors of the C.E.A. power stations were: 1948-49, 43·76%; 1949-50, 44·35%; 1950-51, 47·13%; 1951-52, 46·87%; 1952-53, 44·69%; 1953-54, 43·92%; and 1954-55, 45·20%. The Minister added that capital expenditure of £197·9 millions and £204·5 millions had been authorised for 1955-56 and 1956-57 respectively, but no subsequent authorisation had as yet been given by the Government.

Savings

ASKED what saving he expected to make as a result of the transfer of the engineering and iron and steel divisions to the Board of Trade, Mr R. Maudling stated, in terms of staff, 250, and in terms of expenditure, £576,000.

Steam Plant Survey

THE Minister of Fuel and Power was asked what action he had taken as a result of the findings of the industrial steam survey conducted by his Department 2 years ago. Mr G. Lloyd said the results had been analysed to determine the number of individual cases where the installation of back pressure engines was likely to prove economic. He had arranged with the National Industrial Fuel Efficiency Service to examine, in consultation with the firms concerned, 300 possible schemes where the prospects of saving fuel seemed best.

Fuel Economy

THE National Industrial Fuel Efficiency Service has made excellent progress since it was established last year, said the Minister of Fuel and Power last week, and the loan scheme for financing fuel-saving equipment has proved increasingly effective. He hoped to be making a fuller statement at an early date.

Sayings OF THE WEEK

"If our customers overseas decide not to buy our goods because they are too dear, then we employers together with the trade unions can decide what we like but it will avail nothing." . . . SIR A. WILLIAM GRANT, chairman, Engineering and Allied Employers' West of England Association.

"I venture to think we should get a shock if the annual cost of rent and advertising by the gas and electricity boards were made public." . . . C. A. ARGYLES, writing to the *Financial Times*.

"It is essential to note that the benefits of atomic power can come to you only through the agency of electricity." . . . Mr F. O. STUART, Convener of Moray County Council.

ELECTRIC SUPPLY NEWS

Cumberland

Millom R.D.C. have been told that the North Western Electricity Board hope to start on the new electricity scheme to cover the whole of South and West Cumberland in the next financial year. The Board's No. 6 sub-area manager, Mr J. E. Shepherd has stated that an 11 kV line would be run from Seascale to Silecroft at a cost of £101,000. It will start at Midway, go through Holmrook, skirt Muncaster Chase, go through Broad End and Waberthwaite to Bootle, where it will join the existing line, and then through Whitbeck to Silecroft. An expenditure of £231,983 will be spread over six districts in a rural electricity plan. The districts are: Barrow (£14,413), Kendal (£41,239), Whitehaven (£8,739), Workington (£27,426), Penrith (£106,221), and Carlisle (£33,994). There will be additional expenditure in the Whitehaven area during 1956-7.

Gloucestershire

What was described as the first application of "hot line" working in this country, took place at Alderton last week, when employees of the Midlands Electricity Board tapped a section of the existing 11 kV line without making the line dead. We reported on 7 Oct., 1954, that Mr R. Mallet, Worcester and District sub-area manager of the Board, had devised a system of "hot line" working, using special line taps.

Moray

The first stage of the North of Scotland Hydro-Electric Board's Moray development scheme was completed with the switch on of power at Dallas last Thursday. This first stage was inaugurated last Apr.

North Eastern

A report outlining the progress made in the rural electrification scheme since vesting day was submitted to the quarterly meeting of the North Eastern Electricity Consultative Council at Newcastle-on-Tyne, by the North Eastern Electricity Board. The report stated that there were 1,305 villages and hamlets in the Board's area and on 1 Apr. this year 1,262 had been supplied with electricity. Of the other 43, estimates for 24 had been passed and negotiations were in hand concerning the other 19. The report added that there were about 18,000 farms in the area, and 8,650 had been connected with the electricity system, representing 48% of the total. Since vesting date £2,790,912 had been spent on rural developments, and during 1954-55, a total of 1,483 farms and 6,050 other rural premises received electricity supplies. During 1955-56, the Electricity Board had budgeted to spend £974,000 on rural development, including supplies to 1,750 farms and 5,000 other rural consumers. A quarterly report submitted to the Council stated that in Mar., Apr. and May, 286 substations, concerned chiefly with rural supplies, had been brought into use. During this period also, 13 industrial and commercial consumers received high voltage supplies, and 158 miles of cables and mains were commissioned. The Electricity Board has approved further developments, estimated to cost £1,155,771.

Portishead

Following a local inquiry, the Minister of Fuel and Power has approved the application of the C.E.A. for the use of a further 61 acres of land at Portbury Wharf, for the disposal of ash from Portishead power station.

South Eastern

The rural village of Blackham on the Kent and Sussex borders between Tunbridge Wells and East Grinstead, was given its first public electricity supply earlier this month by the South Eastern Electricity Board. To supply the 70 consumers, necessitated the erection of 4 miles of h.v. lines, seven transformers, 2 miles of l.t. lines—140 poles in all.

South Wales

A total expenditure of £5,300,000 on capital works during the current year is budgeted for in the South Wales Electricity Board's 1955-6 programme. The sum includes £1,640,000 on works to afford supplies for industry, commerce, new houses, and public lighting, etc.; £1,600,000 on system reinforcement; £1,300,000 on works in rural areas; £400,000 on the standardisation of d.c. and non-standard a.c. supplies, and £350,000 on work to provide additional points of bulk supply. The sum allotted for rural work includes £750,000 to afford supplies to individual consumers and localities in rural areas, while the expenditure on standardisation of supplies should reduce the number of consumers on d.c. in the area to insignificant proportions by the end of the year. The Board's expenditure on capital works during the year ended 31 Mar. last amounted to nearly £5m.

LIGHTING SCHEMES

Croydon T.C. It is proposed to convert the lighting of the main road from Norbury to Purley from mercury vapour to sodium, at estimated cost of £23,275.

Gillingham (Kent). The Council has a £15,741 scheme for improving street lighting in the Borough.

Hurstpierpoint. The Parish Council is to spend £3,000 on converting street lighting from gas to electricity.

Scarborough. Consent has been rereceived to the borrowing of £15,500 for the installation of tungsten lighting in Queen St and in various side streets on the South Cliff.

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COMPANY ACTIVITIES

A PROFESSIONAL valuation of the fixed assets of Hick, Hargreaves gives a surplus of £434,000 over book values. Shareholders now get a better view of the company's assets and earnings position. Capital revenue reserves total £1·3 million against the equity of £504,000, and the net tangible assets are 73s. per £1 Ordinary as against the market price of 125s.

After a somewhat complicated change in allocations it can be reckoned that the earnings in the past year came out at £235,000 of which £72,000 is being distributed. Put another way, the earnings represent nearly 13% net and the dividends nearly 4% net on the actual equity money employed in the business of £1·8 million. The market yield at 125s. is £4·1% gross based on the 25% dividend. It can also be seen that the liquid position is good, for cash and tax certificates total £521,000 out of £1,873,000 total current assets.

An interesting point from the speech of Mr A. Rowse, chairman of Venner Ltd., was his announcement that delivery of parking meters to the Commonwealth started last year. The interest in and the success of parking meters overseas reinforces the view that there is a useful market for the meters at home when legislative action is complete, and the advantages of the meter and the meter system generally are appreciated by the public. Meanwhile, Venners meters have been fully standardised and flow production methods established.

Copper producers had better beware. The chairman of Scottish Cables has announced that he is increasingly using aluminium as raw material. At the same time, the company, which is one of the largest of the independents in the cable making industry, is planning further expansion. Attention is being paid not only to growth of output but also to means of cheapening production. Profit margins fell last year despite a record output and with competition increasing all means must be taken to promote economy in manufacturing costs. Additional factory space only recently obtained is already in full use. The company seems in a position to finance its extensions out of its own resources. The cash holding as at March last was £327,000. The South African Associate also seems to be in a strong financial position.

Mr. Fred Jackson, chairman of Telephone Manufacturing Co., in his annual statement, has outlined the tremendous difficulties which face the Post Office in overtaking its arrears in the telephone service and to bring its installations to the point which will allow expansion to proceed economically.

At last there is to be some relaxations in the Treasury's restrictions on the activities of the British Post Office, allowing them to undertake greater capital expenditure.

At the end of 1954 there were 6,139,000 telephones in this country and the net addition for the year was 270,000. If the density and rate of growth were similar to that in the U.S.A., there would have been over 16 million, with a net addition of roughly 760,000.—*From our City Correspondent.*

Associated British Engineering Ltd.

The group trading profit for the year ended 31 Mar. last amounts to £305,524, compared with £205,221 for the previous twelve months. After all charges, including taxation, the net profit is £151,795 (*£148,262*). The dividend is 6% on the larger capital as against a total of 10% last time.

Associated Electrical Industries Ltd.

Proposal to create a balance of unissued capital have been circulated to stockholders. In this, reference is made to the acquisition of the Siemens Brothers 10% Preference by the exchange of shares. To give effect to this offer, the authorised capital of A.E.I. must be increased by at least £1,100,000, according to Lord Chandos, the chairman. The Board recommends the creation of £7 millions of new capital of which £3,900,000 in unclassified shares would remain after the Siemens acquisition. Lord Chandos emphasises that there is no present intention of making a further issue of shares.

Bowthorpe Holdings Ltd.

It is stated that applications for the 550,000 2s. Ordinary shares offered at 8s. 9d. each, amounted to nearly 6 million.

Britannia Electric Lamp Works Ltd.

Group profit for the year ended 31 Mar. last is £61,515 (*£59,513*), after charging taxation. The dividend is again 12½%.

East African Power and Lighting Co.

Sales of electricity during 1954 were 18·2% higher than in the previous year, the directors report. The company's development programme was further advanced with the expenditure of £2,056,440 in Kenya and Tanganyika during the year. The negotiations with the Uganda Electricity Board have been substantially completed, and the Kenya Power Co. formed to deal with that and other sources of supply.

Year to 31 Dec.	£ Operating Surplus	£ Net Profit*	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1950	499,164	252,796	8	7	37/9	32/9
1951	574,952	280,717	7	7	42/9	32/6
1952	681,981	268,237	5	7	34/6	21/6
1953	945,223	401,894	6	7	25/–	21/–
1954	1,264,348	495,823	8	7	23/6	19/3

*Available for parent company.

George Kent Ltd.

After providing for taxation, but including £28,500 in respect of overprovided tax, the parent company's profit for the year to 26 Mar. last is £206,850, compared with £149,414 for the previous period. The final dividend is 12% making a total of 15% (*12½%*).

Mirrless Watson and Co., Ltd.

Orders for condensing and feed-heating plants have been satisfactory, Mr D. McHardy Semple, the chairman, stated at the annual general meeting last Thursday. The Company had been fortunate in obtaining substantial orders for plants in power stations of iron and steel works extensions in this country, as well as plants for the C.E.A., and for a power station abroad. Keener competition was being met in the market for small steam turbines and for centrifugal pumps, but the company's ability to deliver quickly was of considerable assistance here.

Simon-Carves Ltd.

Value of work carried out in 1954 amounted to nearly £16 millions, a record for the company, but there are indications that this figure may be exceeded in the current year, according to Lord Simon, the chairman. Owing to the somewhat conservative method of taking in profits, the results over the years might appear not to have kept pace with the continued expansion. However, the company is now at a stage where a number of the large contracts are being completed and as a result, it is expected that the profits for the next few years should be at least as good as those for 1954, he adds. The order book at the present time is of such proportions that all resources of the company should be fully occupied for at least four years. The Power Plant Department is in the middle of a very large programme of high-pressure water-tube boiler construction, mainly for the C.E.A. In partnership with the General Electric Co., Ltd., a study-group on the application of nuclear energy for power production has been formed.

Vactric Ltd.

The directors now consider the immediate outlook for the company as promising, given stable conditions. Certainly the position of the company seems to have been strengthened. The Service and Precision Control Motor Departments have been rehoused, and the precision tool section expanded and re-equipped. Net current assets have also increased from £553,000 to £720,000, but alongside this there is a substantial rise in trade debtors, largely in connection with hire purchase, causing a corresponding increase in the bank overdraft.

Year to 31 Mar.	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1951	309,008	174,437	219	—	14/3	7/3
1952	209,891	73,288	90	—	7/6	3/–§
1953	–30,339*	–84,590*	—	—	10/3	3/6
1954	366,170	113,198	129	10	25/6	7/6
1955	556,744	267,617	151	15†	20/3	12/–

*Loss. †Plus 200% capital bonus.

Dividends Declared

British Industrial Plastics Ltd. Interim of 7½% (*same*), but on increased capital.

Sun Electrical. Interim of 5%.

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

22 July—Derby T.C. Installation in 100 houses at Chaddesden and Mackworth.—See 7 July issue.

22 July—Leicester. Street lighting at Glenfield roundabout.—See 7 July issue.

22 July—Longbenton U.D.C. Electrical installations in 30 houses at Fordley estate, Section V.—See 14 July issue.

22 July—Warwick T.C. Steel columns with fluorescent lanterns for class A street lighting along A.41.—See 7 July issue.

23 July—Girvan T.C. Electric lighting installations in 40 houses at Mote site.—See 14 July issue.

23 July—Hastings T.C. Installation at secondary modern school, Red Lake.—See 30 June issue.

23 July—Ince-in-Makerfield U.D.C. Installation in 20 houses on Battersby St site.—See 7 July issue.

23 July—Kirkcaldy T.C. Electrical work at the Water Department's houses—See 14 July issue.

23 July—Lichfield T.C. Steel columns, sodium and fluorescent lanterns for Group A lighting along B.5312.—See 7 July issue.

25 July—Castle Douglas T.C. Installation in extension to town hall.—See 7 July issue.

25 July—Durham T.C. Supply and erection of 15 250 W mercury vapour lighting units at Neville's Cross Bank.—Advertised 14 July issue.

25 July—Manchester T.C. Installation at Kirkmanshulme grammar school.—See 30 June issue.

25 July—Northern Ireland. Electrical engineering installation in new ward block at Royal Victoria Hospital, Belfast.—See 14 July issue.

26 July—Consett U.D.C. Electric floor heating and lighting in the Council's Central Depot to be built at Villa Real. Engineer and surveyor, Council Offices, Medomsley Rd, Consett.

26 July—Ilford T.C. Supply of concrete columns, lanterns, lamps, etc.—Advertised 14 July issue.

26 July—Llwchwr U.D.C. Supply and erection of columns and lanterns on trunk road A48.—See 14 July issue.

27 July—Cardiff R.D.C. Renewal of electrical installations in 15 houses in Castle Rd, Tongwynlais. S. P. Youldon, engineer and surveyor, Council Offices, 20 Park Place, Cardiff. Deposit £3. 3s.

27 July—Prestwich T.C. Conversion of 490 existing gas lamps to tungsten lighting, and the provision of 35 additional lighting points.—See 14 July issue.

27 July—Swansea T.C. Installation in Technical College workshops, Mount Pleasant.—Advertised in 7 July issue.

28 July—Brighouse T.C. (*a*) Supply of 61 400 W mercury discharge units with control gear, time switches, columns and brackets.—See 14 July issue.

28 July—Middleton T.C. Supply of lanterns for sodium and tungsten lamps, brackets, etc.—See 14 July issue.

28 July—Stoke-on-Trent T.C. Supplies of electric lamps for six months from 30 Sept. City surveyor, Town Hall, Stoke-on-Trent.

29 July—Poole T.C. Electrical installation at Longfleet Primary School. Borough engineer, Municipal Bldgs, Poole. Deposit £2. 2s.

29 July—Rochdale T.C. Electric lighting and power installations at Derby St Junior and Infants' School. Town clerk, Town Hall, Rochdale.

30 July—Ashbourne U.D.C. Two sets of sewage pumps, with motors, starters, etc.—See 14 July issue.

30 July—Bury T.C. Public address system for the Market Hall and Open Market.—See 14 July issue.

30 July—Sleaford (Lincs) U.D.C. Mercury discharge units with control gear, concrete columns and cast-iron brackets, along class B roads.—See 7 July issue.

31 July—Cheshire. Applications invited for inclusion in approved list of contractors.—See 7 July issue.

1 Aug.—Northwich U.D.C. Electrical installation to 76 dwellings on Leftwich estate. J. R. W. Clark, engineer and surveyor, the Council Hse, Church Rd, Northwich.

1 Aug.—Stornoway T.C. Electrical installation in 14 houses in Newton St.—See 14 July issue.

2 Aug.—Manchester T.C.—Electrical installations in (*a*) 49 flats and A.P.D.s at Floats Hall Rd; 58 flats and A.P.D.s at Greenbrow Rd, and 43 flats and A.P.D.s at Colshaw Rd, Wythenshawe; and (*b*) 59 houses and maisonnettes at Northern Moor and 10 maisonnettes and flats at Langley Estate. Director of Housing, Town Hall, Manchester 2.—Advertised in this issue.

2 Aug.—Sheffield T.C. Electrical installation at Chaucer Secondary Modern School.—See 14 July issue.

3 Aug.—Worsley U.D.C. Columns and fittings for a 140 W lighting scheme on Clegg's Lane, Armitage Ave and Peel Ave.—See 14 July issue.

4 Aug.—Coppull (Lancs) P.C. Sodium discharge street lighting units for trunk road A.49.—See 30 June issue.

6 Aug.—Stafford T.C. Erection of 28 Class "A" and 139 Class "B" concrete columns and lighting equipment. T. H. Higson, engineer and surveyor, Mount St, Stafford. Deposit £2. 2s. Advertised in this issue.

8 Aug.—St. Albans T.C. Supply of concrete group "B" lighting columns. City engineer and surveyor, 16 St. Peter's St, St. Albans.

11 Aug.—Belfast T.C. Passenger/goods lift of 2,000 lb capacity at Power Station West.—Advertised in 30 June issue.

13 Aug.—Chepstow U.D.C. Provision and erection of 36 steel columns and 17 wall-mounting brackets, together with supply and fixing of 140 W sodium lanterns and auxiliary equipment on trunk road A48. E. M. Taylor, surveyor, Gate Hse, Chepstow, Mon. Advertised in this issue.

13 Aug.—Halifax T.C. Two electrically driven pumps.—See 14 July issue.

19 Aug.—East Ham B.C. (*a*) Supply and erection of standards, and (*b*) delivery and erection of street lighting equipment for Little Ilford Lane, Church Rd (part), Browning Rd (part) and Gladstone Ave, involving 61 25 ft concrete columns and 11 15 ft columns, with lamps, lanterns and ancillary gear. Borough engineer, Town Hall, East Ham, E.6. Deposit £2. 2s.

9 Sept.—Belfast T.C. (*a*) 33 kV switchgear equipment extensions to and modifications on existing Reyrolle switchboards at six substations; and (*b*) five 33/6·6 kV 12,500 kVA outdoor transformers. Details from Merz and McLellan, Carliol Hse, Newcastle upon Tyne. Deposit £5. 5s. each. Advertised in this issue.

1 Oct.—Islington B.C. Rewiring of the Council's Public Baths, Greenman St.—Advertised 14 July issue.

No date stated—N. of Scotland H.E. Board. 132 kV double and single circuit steel tower overhead lines around Aberdeen.—Advertised in 7 July issue.

No date stated—N. of Scotland H.E. Board. Lighting, heating and auxiliary power installation at Nairn substation.—Advertised in 7 July issue.

Date not stated.—N. of Scotland Hydro-Electric Board. 33 kV lines for the turn-in of existing lines to Kintore substation.—Advertised 14 July issue.

No date stated.—Greenock T.C. Electrical sub-contract for Whinhill Filter

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources including an index of trade information with over 100,000 entries

A Selection from the 126 queries answered this week

"Empire" trouser presses, address for? S.P.—Lighters Ltd., Pioneer Hse, Inverness Rd, Hounslow.

"Ergon" infra-red equipment, makers of? S.W.B.—Ergon Electrical Mfg. Co., Ltd., Vencourt Place, King St, Hammersmith, W.6.

Jointing compound melting equipment—portable oil furnace, makers of? J.F.W.—Portable Furnace and Patents Co., Carrington, Nottingham; Hugh Pritchard and Co., Old Basford, Nottingham.

Eralite Ltd., address for? H.A.D.—This concern, formerly of 194 Broadway, S.W.19, went out of business in 1948. There are no manufacturers spares available at the present time.

"Tubalox" urn element, makers of? S.E.B.—We presume this to refer to the "Tubalox" products of Geo. Bray and Co., Ltd., Leicester Place, Leeds 2.

"Beatty" washing machines, address for? L.E.C.—Beatty Bros. (Tenbury) Ltd., Station Bldgs, Stamford New Rd, Altrincham, Ches.

"Systym" irons, makers of? T.E.S.—Tym's Electric, Systym Works, Kennard Rd, E.15.

Station. Apply to Babtie, Shaw and Morton, consulting engineers, 17 Blythswood Sq, Glasgow C.2.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon House, Theobalds Rd, W.C.1, quoting reference.*

4 Aug.—South Africa. 12,000 24 V and 5,000 50 V switchboard lamps, for Union Tender and Supplies Board. B.o.T. (Ref.: ESB 14873/55).*

5 Aug.—Australia. 200 tons of 19/0·083 h.d. bare copper cable, 80 tons 7/0·104 ditto, and 100,000 yds 7/0·064 p.v.c. insulated h.d. copper cable, for Brisbane City Council. B.o.T. (Ref.: ESB 14650/55).*

6 Aug.—Pakistan. Various quantities of insulators, h.d. copper wire, galvanised iron wires, copper sleeves, etc. B.o.T. (Ref.: ESB 14712/55).*

8 Aug.—India. Tenders (ED 714-1) invited for instrument transformers for substations at Howrah, Barhi, Gaya, Patna and Dalmianagar. Chief Electrical Engineer, Damodar Valley Corpn., Anderson Hse, Alipore, Calcutta. B.o.T. (Ref.: ESB 13500/55).*

10 Aug.—Iraq. Two 250 kVA and five 50 kVA transformers for Haditha. B.o.T. (Ref.: ESB 14792/55).*

25 Aug.—India. Various quantities of armoured telephone cables, for Director-General of Supplies and Disposals, Shahjahan Rd, New Delhi. B.o.T. (Ref.: ESB 14286/55).*

26 Aug.—Australia. 60 lightning arrestors for 33 kV, for Brisbane City Council. B.o.T. (Ref.: ESB 14682/55).*

1 Sept.—India. 22 kV and 6·6 kV switchgear and accessories for main receiving station at Mahim, for Bombay Electric Supply and Transport Undertaking. Tender documents from Tata Ltd., 18 Grosvenor Place, S.W.1.

9 Sept.—New Zealand. Post Office invites tenders for 27 miles of various types of electrical cable. Contract No. P and T 150/8064. Director-General, Stores Div., G.P.O., Wellington.

14 Sept.—Australia. Supply of material, survey, erection, etc., of 132,000 V overhead transmission line between Tully Falls and Townsville. Specif: TF/35. State Electricity Commission of Queensland, Scottish Union Hse, Eagle St, Brisbane. B.o.T. (Ref.: ESB 13922/55).*

15 Sept.—Iraq. One 150 kW and one 75 kW diesel alternator sets with all associated equipment to supply the town of Dehuk. B.o.T. (Ref.: ESB 14791/55).*

17 Sept. Iraq. Two 150 kW and one 75 kW diesel alternator sets and one 150 kW alternator, etc. for Samarrah. B.o.T. (Ref.: ESB 14790/55).*

20 Sept.—Iraq. Supply and erection of one 500 kW and two 250 kW a.c. generating sets, two 1,500 kVA transformers and associated h.v. and l.v. control switchgear, for Kut Town. Directorate-General of Municipalities, Baghdad. B.o.T. (Ref.: ESB 13761/55).*

20 Sept.—Pakistan. Two steam turbo-alternators for 5,000 kW capacity, with 55 klb/hr boilers and auxiliaries; or two 500 kW gas turbine generators, plus 6·6 kV switchgear, a 500 kW diesel generating set, crane, etc., for Dept. of Supply and Development, Frere Rd, Karachi. Specifications from High Commissioner in London, 39/40 Lowndes Sq, S.W.1.

24 Sept.—Iraq. One 500 kW and two 250 kW diesel alternator sets, with switchgear and two 1,000 kVA transformers, for Diwaniya. B.o.T. (Ref.: ESB 14789/55).*

5 Oct.—Turkey. Two 2,625 kVA hydro-electric turbo-generators for Trabzon-Degirmandere plant, and 20 kM of 66 kV line. Specifications from Iller Bank, Genel Mudurlugu, Ankara.

5 Nov.—Iraq. Supply, erection and supervision of operation of a power station for a complete sugar plant near Mosul. Particulars from Iraq Embassy in London.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Cyclocell. 740,319. Class 7. Dust extractors. 740,320. Class 11. Dust removing installations. Visco Eng. Co., Ltd., 161 Stafford Rd, Croydon.

Fractichron. 740,460. Class 9. Electronically operated time measuring apparatus. Dimafon Ltd., 10 St. Swithin's Lane, E.C.4.

Cut-the-Cackle. 741,139. Class 9. Electric switches. Emile Littler, 31 St. Martin's Lane, W.1.

Hobourn. B721,557. Class 11. Heating apparatus, etc. Hobourn Domestic Appliances Ltd., Stroud, Rochester, Kent.

Prestwarm. 741,234. Class 11. Air conditioning apparatus. Pressed Steel Co., Ltd., Cowley, Oxford.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, 19 July

	£ per ton	Weekly change £	Price last year £
COPPER, standard class A (settlement)	353	+11	239½
,, (3 months)	346	+7½	237
R.S.T. (Rhodesian Selection Trust) group price*	280	—	—
LEAD, refined pig, min. 99·97% purity (cash)	106½	+1½	96½
,, (3 months)	106½	+1½	94½
TIN, refined, min. 99·75% purity (settlement)	764	+31	759
,, (3 months)	755	+25	752
ALUMINIUM, ingots 99·99·5%	171	—	156
ZINC, virgin, min. 98% purity (cash)	92	+½	77½
,, (3 months)	91½	—	78
RUBBER No. 1, RSS. spot (per lb.)	38d.	—	20½d.
,, c.i.f. basis, ports, Sept. (per lb.)	35½d.	+½d.	20 7/16d.
ARMOURING :			
Galv. Steel Wire (0·104 in.)	54	—	52
Mild Steel Tape (0·014 in.)	41½	—	40½

(*Fixed price c.i.f., U.K. originally operative for 30 days from 9 May to "consumers willing to instil a degree of stability into the resale price." Pending new notification, price subject to change at 24 hr. notice.)

Gazette Announcements

COMPANIES ACTS

Electronics (Leeds) Ltd. Resolution for voluntary winding-up passed at meeting on 7 July. Mr M. T. Kendrick, Norwich Union Building, City Sq, Leeds 1, appointed liquidator.

Selway's Neon Lighting of Wales Ltd. Meeting of members and creditors at 7-10 Oxford Buildings, Swansea, on 18 Aug. at 12.30 p.m., to receive report of Mr G. Thomas, liquidator, on winding-up.

Electrical and Radio Engineers (Golders Green) Ltd., formerly of 16 Soho Sq, W.1. For proposed payment to preferential creditors apply to J. M. Clarke, official receiver and liquidator, Inveresk Hse, 346 Strand, W.C.2, by 30 July.

BANKRUPTCY ACTS

Release of Trustee

Wisbech. Goetze, Roy Boleslave, electrical contractor, lately of Old Market, Wisbech. Trustee, Mr C. A. Taylor, 41 Sidney St, Cambridge, released as from 11 July.

Dividend

Ashton-under-Lyne. Page, Edward Booth, electrical engineer, 10/12 John St, Hyde. Supplemental dividend of 10s. 3¾d. in £, payable on 22 July at official receiver's office, 20 Byrom St, Manchester 3.

Contracts Placed

Central Electricity Authority. Contracts for plant for power stations, transforming stations and transmission lines during the past month aggregated £16,647,000. The principal contracts include: Drakelow "B" power station, one 120 MW turbo-generator, feed-water heating and evaporating plant, condensing plant, etc., C. A. Parsons and Co.; Staythorpe "B," two 60 MW turbo-generators and feed heating plant, Metropolitan-Vickers, one 60 MW turbo-generator, General Electric Co., and condensing plant for three 60 MW sets and feed heating plant for one, Worthington-Simpson Ltd.; Little Barford "B," two 60 MW turbo-generators, feed water heating and condensing plants, and one 72 MVA generator transformer, C. A. Parsons and Co., and two 550 klb/hr boilers, Foster Wheeler Ltd.; Marchwood power station, two 550 klb/hr boilers, John Thompson; Skelton Grange "B," boiler feed pumps, Sulzer Bros. (London) Ltd.; 132 kV switchgear at West Weybridge substation, A. Reyrolle and Co., Ltd.; 132 kV line Cardiff West-Pyle/Ebbw Vale, J. L. Eve Construction Co., Acton Lane power station, demolition and foundations, Sir Robert McAlpine and Sons; Belvedere power station, main foundations, underbuilding, John Mowlem and Co., and two 7,500 kVA station transformers, Hackbridge and Hewittic Electric Co., Ltd.; Poole power station, foundations, George Wimpey and Co., Ltd.; Portishead "B," ash and dust handling plant, John Thompson Industrial Construction Ltd.; Goldington, steel frame for turbine house and boiler house buildings, John Booth and Sons (Bolton) Ltd.; Castle Donington, one cooling tower, Mitchell Construction Co.; Willington "A," two reinforced concrete chimneys, Tileman and Co.; Ocker Hill, main building and structure, Sir Alfred McAlpine and Son.

BUSINESS PROSPECTS

Home

Ashington (Northumberland). Wm. Stockdale, 73 Howard St, North Shields, is architect for new cinema in Lintonville Terr, for Essoldo Circuits Ltd.

Birmingham T.C. Erection of 29 dwellings, 18 shops and office accommodation on 3 sites. Contracts Nos. 504, 520 and 521. City Architect, Civic Centre.

Cheltenham. Factory, offices and stores at Oakley Gdns, Bouncers Lane, proposed for Premier Polish Co., Ltd., and factory extensions at Grosvenor Place South for Severn Valley Meat Products Ltd.

Chesterfield R.D.C. Erection of 20 houses at Brimington. Councils' Architect.

Chippenham T.C. (Wilts). Recommended to approve 59 dwellings at Hungerdown Lane estate for E. H. Bradley and Sons Ltd., 1 Hardenhuish Ave.

Cuckfield R.D.C. (Sussex). Erection of 90 dwellings at Wickham Place, College Lane, Hurstpierpoint approved for J. L. Titchmarsh.

Doncaster T.C. Erection of 50 houses as part of stage IV of Canley Estate. Erection of Transport Dept. canteen in Factory Lane. Borough Architect.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, W.C.2.

Sir George Godfrey and Partners (Holdings) Ltd., Hampton Rd, Hanworth, Middlesex. To acquire the issued share capital of Godfrey (Hanworth) Ltd., and to adopt an agreement with Wm. D. L. Theed, E. P. Theed, S. Theed, V. M. Theed, R. Knight, P. B. Knight, G. N. Kingsford, R. W. Everall, F. G. Feather and Industrial and Commercial Finance Corporation Ltd. Power is also taken to carry on business of manufacturers of and dealers in mechanical, electrical, pneumatic and general power devices, etc. Nom. cap.: £100. Dirs.: W. D. L. Theed, G. N. Kingsford, R. Knight and R. W. Everall.

Aloyd Ltd., 68 Argyle St, Birkenhead. Electrical and mechanical engineers and manufacturers, etc. Nom. cap.: £700. Dirs.: J. Allan, Marjorie Allan and F. C. Lloyd.

Vide (Southern) Ltd., 902 Wimborne Rd, Bournemouth. Manufacturers, reconditioners, repairers, purchasers and sellers of electrical appliances, dealers in radio and television sets, etc. Cap.: £2,000. Dirs.: F. King, H. W. Standbridge, C. A. Davies.

Barbados Light and Power Co., Ltd., British address: Suffolk Hse, Laurence Pountney Hill, E.C.4. Registered in Barbados, British West Indies on 6 May, 1955. Cap.: $5,000,000 in $5 shares (100,000 cum. pref.). Names of persons authorised to accept service: W. A. Brown and D. R. P. Baker, Suffolk Hse, E.C.4.

Nuclear Research Applications Ltd., 34/40 Ludgate Hill, E.C.4. Cap.: £100. Dirs.: M. Falk and Rebecca J. Falk.

Electrical Process Controls Ltd., 10 Park Sq, Leeds. Manufacturers and sellers of electrical and other heaters, electric fires, etc. Cap.: £100. Dirs.: G. Smith and G. A. Fox.

Auto-Vision Ltd., 328 Liverpool Rd, N.7. Manufacturers of and dealers in electrical and mechanical apparatus and accessories, in particular wireless sets, etc. Cap.: £1,000. Dirs.: S. A. Halls, R. H. Jewson, P. Connell, and K. G. Briskham.

Edmonton T.C. Recommended to approve factory extensions at Gothic Works, Angel Rd, N.18, for Glover and Main Ltd.; at Park Rd, N.18, for MK Electric Ltd., Architects Fuller, Hall and Foulsham, 212 High Holborn, W.C.1.; at Perseverance Works, 18 Commercial Rd, N.18, architects, I. H. McLaren, 6 Broadway, S.W.19. Erection of plant, workshops at Angel Rd, N.18, for British Oxygen Eng. Ltd.

Fife. Co. E.C. announce £4,909,200 school building programme.

Glasgow T.C. Erection of 264 houses in areas V4, W4 and X4 Castlemilk. Architectural and Planning Dept., 20 Trongate.

Grantham T.C. Recommended to approve factory extension at Gonerby Hill Foot for Fencroft Eng. Ltd.

Hayes and Harlington U.D.C. (Middx). To apply to borrow £104,380 for 60 flats on Barnhill estate.

Leicester T.C. School for backward children in Glenfield Rd extension. City Architect.

Liverpool T.C. Recommended to borrow £66,000 for extensions to Morrison secondary modern school; to lease 42 acre factory site at Kirby industrial estate to A.C.-Delco, Dunstable.

Loughborough T.C. Erection of second (£150,000) swimming bath proposed. Borough Architect.

Sheffield. Plans approved for new £500,000 library in Weston St. for University.

Somerset. Erection of Yeovil Buckler's Mead secondary modern school. Chief Education Officer, County Education Office, Trull Rd, Taunton.

South Shields. Offices at Templetown to be built by C. W. Taylor and Sons Ltd. Plans approved.

Southport. A. E. Thornton-Firkin and Partners, 17 Fitzhardinge St, W.1, are quantity surveyors for new factory in Meolo Cop Rd for Mullard Ltd.

Staines U.D.C. (Middx). Erection of 42 houses on Convent housing estate Ashford. Engineer and Surveyor, 240 London Rd.

Sunderland T.C. Approved £23,000 scheme for new premises for Pennywell Working Men's Club; architect J. M. Angus, 21 Lovaine Place, Newcastle. Highways Committee approved the erection of hotel in Barnes Park Rd, with 20 bedrooms together with usual lounges, dining rooms and 12 garages; application was submitted by G. H. Plemper Ltd., St Hilda's Works, Old Chester Rd. T.C. to purchase land for £60,000 service garage at Fulwell. Borough Architect, H. C. Bishop, Grange House, Stockton Rd.

Surrey. Erection approved of instalment of £146,575 Frimley and Camberley County secondary school.

Swindon T.C. Recommended to approve a £106,000 industrial estate factory. To sell factory site on industrial estate to Metal Box Co., Ltd., The Langham Portland Place, W.1.

Unclassified. Minister of Health has announced a £17½m. hospital building programme including new hospitals at Crawley, Harlow, Hensingham, West Cumberland, Swindon, Truro, Huddersfield, Swansea, Coventry and Wythenshawe.

Walsall T.C. Erection of a total of 106 houses on Moseley estate. Borough Engineer and Surveyor, M. E. Habershon, Council Hse.

Watford B.C. Erection of 50 houses in Meriden neighbourhood, Garston. Borough Engineer and Surveyor, Town Hall.

West Bromwich B.C. Erection of 85 dwellings on Yew Tree Estate. Borough Engineer and Surveyor, Town Hall. Recommended to approve factory offices at Goldhill for Midland Moor Cylinder Co., Ltd., Dartmouth Rd, Smethwick

Willenhall (Staffs) U.D.C. Erection of 134 houses on New Invention No. 2 site. Architect, E. E. Bannington, Town Hall.

Wilts. Erection of primary school at Upavon. P. A. Selborne Stringer, County Hall, Trowbridge.

Wokingham R.D.C. Erection of 31 dwellings, Ruscombe. Architect, E. G. V. Hives, 3 Cork St, Reading.

Overseas

Canada. Gravity Flow Heating Equipment Ltd., 2625 Albert St, Montreal, a newly-established firm, want to contact U.K. makers of f.h.p. motors of 1/50 to 1/20 h.p., 110 V, 60 c/s, 1,725 r.p.m., fitted with reduction gear to give 43 r.p.m.

D. M. Anderson, president, Interior Industrial Electric Ltd., 256 Lawrence Avenue, Kelowna, B.C., wishes to contact U.K. makers of electric motors of up to 250 h.p., and makers of speed reduction units up to 25 h.p. at 96 r.p.m. to 64 r.p.m.

New Zealand. Mr W. S. Green, of the Wellington firm of that name, who is shortly due to arrive in London, wishes to obtain exclusive agencies for electric toasters, blankets, fan heaters, room thermostats, resin-cored solder, electric fences, and various radio components. He may be contacted at Rodney Hotel, 28 De Vere Gdns, Kensington, W.8.

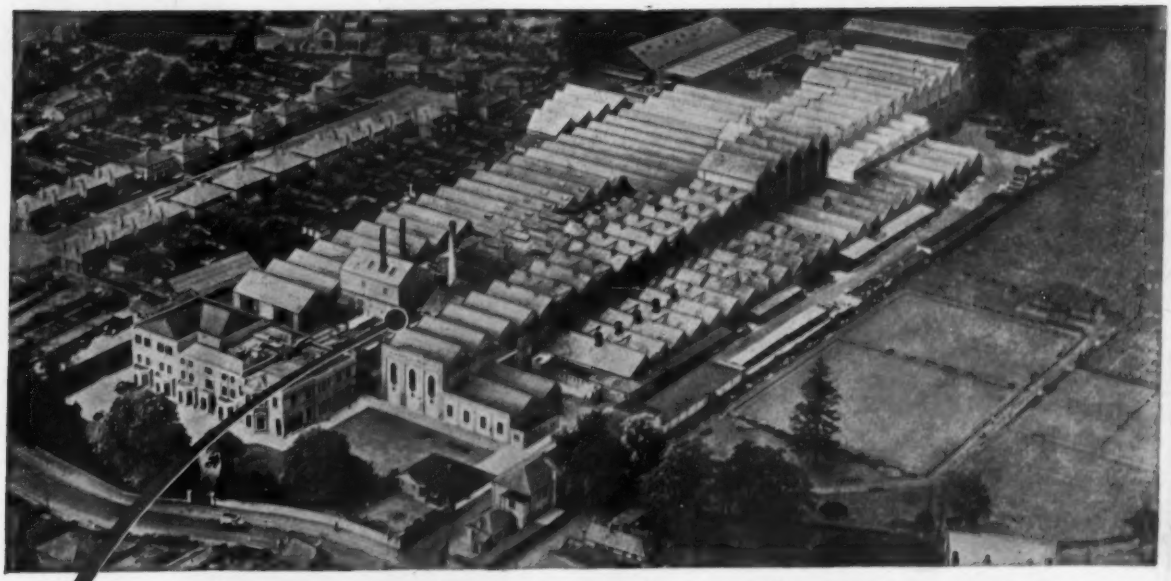
Trade Notes

Beama Contract Price Adjustment Formulæ.—*For Electrical Machinery and Equipment* For purposes of calculating variations in: (*a*) "Rates of Pay"—the rate of pay for adult male labour at 16 July, 1955, shall be deemed to be 162s.; (*b*) "Cost of Material"—the index figure for materials used in the Electrical Machinery Industry published in the Board of Trade Journal on 16 July, 1955, is 180·1.*

For Turbo-Generating and Allied Plant. For purposes of calculating variations in: (*a*) "Rates of Pay"—the rate of pay for adult male labour at 16 July, 1955, shall be deemed to be 162s.; (*b*) "Cost of Material"—the index figures published in the Board of Trade Journal on 16 July, 1955, are: Materials used in Mechanical Engineering Industries—163·8*, "Blast Furnaces and Iron and Steel Melting and Rolling (40 and 41)"—147·7*. The price of brass condenser tubes, ¾ in. o/d 18 s.w.g. published in *The Metal Bulletin* on 15 July, is 4s. 4½d. per lb.

For Outstanding Contracts covered by the B.O.T. Intermediate Products Index. For purposes of calculating variations in (*a*) "Rates of Pay"—the rate of pay for adult male labour at 16 July, 1955, shall be deemed to be 162s. (*b*) "Cost of Material"—the index figure for Intermediate Products published in the Board of Trade Journal on 16 July, 1955, is 374·1* (*provisional).

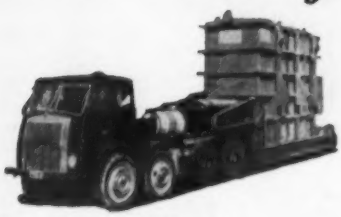
New Branch. Permanoid Ltd. have opened a Midlands branch at 558 Wolverhampton Rd East, Fighting Cocks, Wolverhampton. Telephone Wolverhampton 38367. The manager is Mr D. J. Blashill.



MADE IN ENGLAND – *for the World*

SOUTH AFRICA

Seven 13,333 kVA 88 kV single phase Hackbridge interconnecting transformers to form two 40 MVA 3 phase banks.



AUSTRALIA

Five 30 MVA 132/33 kV 3-phase Hackbridge transformers for the Electricity Commission of New South Wales.

INDIA

Four 20 MVA 100/6.6 kV. 3-phase Hackbridge transformers for the Tata Hydro Electric Power Supply Co. Ltd.

CHINA

Three 5 MVA 33-22/6.6 kV. 3-phase Hackbridge transformers. Photo by courtesy of the China Light and Power Co. Ltd.

ENGLAND

Six 70 MVA 11/134 kV. 3-phase Hackbridge transformers for Skelton Grange Power Station, Leeds

CANADA

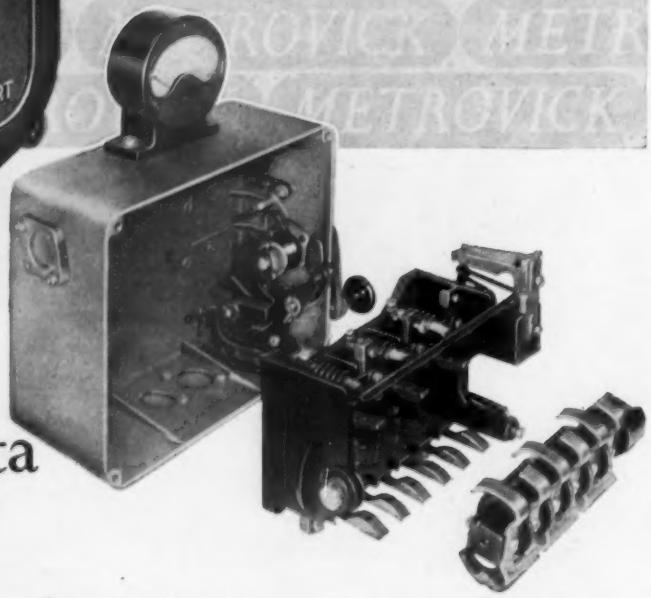
Two 60 MVA 125/66 kV Hackbridge transformers for Shawinigan Falls Power Station, Quebec.

OVER 21 MILLION KVA
IN WORLD WIDE SERVICE

HACKBRIDGE
TRANSFORMERS

HACKBRIDGE AND HEWITTIC ELECTRIC CO., LIMITED
WALTON-ON-THAMES - SURREY - ENGLAND
Telephone: Walton-on-Thames 760 (8 lines) Telegrams & Cables: "Electric, Walton-on-Thames"

A GOOD NAME FOR STARTERS



METROVICK air-break star-delta starters

The Metrovick reputation is based on sound engineering design and good workmanship. The standard is maintained in the type ASD series of starters which conform with BSS.587. They are suitable for squirrel cage motors up to 25 H.P. 650 volts and are available for immediate delivery. Write for full technical details.

Type ASD starters are intended for use in general industrial applications.

METROPOLITAN-VICKERS
ELECTRICAL CO LTD TRAFFORD PARK MANCHESTER 17

Member of the A.E.I. group of companies

H/A006

CLASSIFIED ADVERTISEMENTS

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 32s. 6d. per inch, and all other classified advertisements at 2s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

TENDERS INVITED

CITY OF MANCHESTER
HOUSING COMMITTEE

TENDERS are invited for Electrical Installations in connection with the following housing schemes:

Contract 228—49 Flats and A.P.D.s, Floats Hall Rd, Wythenshawe.

Contract 229—58 Flats and A.P.D.s, Greenbrow Rd, Wythenshawe.

Contract 230—43 Flats and A.P.D.s, Colshaw Rd, Wythenshawe.

Tender Forms and Schedules may be obtained on application to the Director of Housing, Town Hall, Manchester 2, and must be returned in a sealed official envelope, addressed to the Chairman of the Housing Committee to be received at the office of the Town Clerk not later than noon on Tuesday, 2 Aug., 1955.

PHILIP B. DINGLE,
Town Clerk.
(T 530)

CITY AND COUNTY BOROUGH OF BELFAST
Electricity Department

TENDERS are invited for the Supply, Delivery and Erection of:

(*a*) 33 kV Switchgear Equipments as extensions to and also apparatus for modifying equipments on existing Reyrolle metalclad switchboards at Mountpottinger, Main Central, Skegoneill St, Malone, Dunmore and Donegall Substations (Form of Tender No. N.1683).

(*b*) Five 33/6·6 kV 12,500 kVA Outdoor Stepdown Transformers with on-load tap-changing equipment (Form of Tender No. N.1736).

Forms of Tender, Conditions, Specifications, and Drawings, in quintuplicate, may be obtained from Messrs. Merz and McLellan, Consulting Engineers, Carliol House, Newcastle upon Tyne 1, on payment of a deposit of Five Guineas in respect of each item (*a*) and (*b*), which deposits will be refunded provided bona fide tenders are lodged and not withdrawn. Extra copies of each of the contract documents may be obtained at One Guinea each; this sum will not be returnable. Cheques should be made payable to the Belfast Corporation Electricity Department.

Each Tender, in quadruplicate, in sealed envelope marked "Tender for . . . . . Electricity Committee," and endorsed with the name and address of the tenderer, must reach the undersigned not later than 4 p.m. on Friday, 9 Sept., 1955.

An official receipt must be obtained for each tender delivered by hand. Tenders sent by post should be registered.

The lowest or any tender will not necessarily be accepted.

TOWN CLERK.

City Hall Belfast.
13 July, 1955. (T 558)

CHEPSTOW URBAN DISTRICT COUNCIL
Street Lighting—Tenders

TENDERS are invited for the Provision and Erection of Group "A" Street Lighting Installations on Trunk Road A.48, within the Urban District as follows:

The provision and erection of 35 Steel Columns and 17 wall-mounted brackets, together with the supply and fixing of the required 140 W Sodium Lanterns with Auxiliary equipment.

Copies of the specification, tender form, etc., are obtainable upon application to E. M. Taylor, Surveyor, Gate House, Chepstow, Mon.

The Council do not bind themselves to accept the lowest or any Tender.

Tenders, in sealed envelopes, marked "Tender—Street Lighting" but not bearing any name or mark indicating the sender, to be received by me not later than Saturday, 13 Aug., 1955.

A. GILL,
Clerk of the Council.

Gate House,
Chepstow, Mon.
12 July, 1955. (T 529)

BOROUGH OF STRATFORD
STREET LIGHTING

TENDERS are invited for the erection only of 28 No. Class A and 139 No. Class B precast concrete columns and lighting equipment on roads within the Borough of Stafford.

Drawings may be seen and copies of the Specification, Bill of Quantities and Form of Tender obtained on application to Mr T. H. Higson, B.SC., A.M.I.C.E., Borough Engineer and Surveyor, Mount St, Stafford, on payment of a deposit of two guineas which will be returned on receipt of a bona fide tender and all documents.

Tenders enclosed in a plain sealed envelope and endorsed "Street Lighting," must be delivered to the undersigned not later than 12 noon on Saturday, 6 Aug., 1955.

The Council do not bind themselves to accept the lowest or any Tender.

T. BROUGHTON NOWELL,
Town Clerk.

Borough Hall,
Stafford.
12 July, 1955. (T 575)

CITY OF MANCHESTER
HOUSING COMMITTEE

TENDERS are invited for Electrical Installations in connection with the following housing schemes:

Contract 219—59 Houses and Maisonnettes, Northern Moor.

Contract 224—10 Maisonnettes and Flats, Langley Estate.

Tender Forms and Schedules may be obtained on application to the Director of Housing, Town Hall, Manchester 2, and must be returned in the sealed official envelope provided, addressed to the Chairman of the Housing Committee, to be received not later than noon on Tuesday, 2 Aug., 1955.

PHILIP B. DINGLE,
Town Clerk.
(T 531)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18–64, or a woman aged 18–59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

A CAREER AS A REGULAR ARMY OFFICER FOR QUALIFIED ENGINEERS

MECHANICAL, ELECTRICAL and ELECTRONIC ENGINEERS are required as officers in the Corps of Royal Electrical and Mechanical Engineers.

There are two methods of entry. These are either:

(1) On a short service commission (which offers a good opportunity of obtaining a permanent commission) with a gratuity of about £100 for each completed year of service on leaving

or

(2) On a Permanent Regular Commission with a valuable pension and a terminal grant of £1,000 (tax free).

Candidates must be physically fit and between the ages of 23 and 28 years old (except for those with previous service in the Armed Forces, who may be 30 years old). They must have passed or be exempt from the examinations of either the Institution of Mechanical Engineers or the Institution of Electrical Engineers, or have a University Degree in Natural Science or Engineering. In addition, 2½ years' experience as an engineer (or 1½ years in the case of University graduates) is normally required. Additional seniority is given for an honours degree and for approved engineering experience.

The pay which Army officers may expect is according to the following table:

Rank	*Normal Age*	*If Single* £	*If Married* £
Lieutenant	23	686	823
Lieutenant	25	723	860
Captain	27	866	1,005
Major	34	1,193	1,330
Lt-Colonel	42	1,512	1,640
Colonel	45	1,795	1,922
Brigadier	49	2,068	2,187
Major-General	49 or over	2,634	2,744

Note.—This is the U.K. scale; there are various additions in certain overseas station.

(In this table the figures of a single officer's pay include an element for food and accommodation which are normally provided in kind. This has been made to provide a direct means of comparison with civilian scales of pay).

For further details please write to:
The War Office (P.A.6(*b*)), London, S.W.1, and quote this announcement.
(T 276)

SOUTHERN ELECTRICITY BOARD
REFRIGERATION REPRESENTATIVE

OXFORD DISTRICT of No. 2 (Newbury) Sub-Area. Salary N.J.C. Grade 3 (£585/£645 per annum). N.J.C. Conditions of Service.

Candidates should have experience of commercial refrigeration applications, be able to prepare specifications and estimates, conduct negotiations and obtain new business.

WAYLEAVE OFFICER

Swindon District of No. 2 (Newbury) Sub-Area. Salary N.J.C. Grade 2 (£525/£585 per annum). N.J.C. Conditions of Service.

Candidates must have ability to negotiate Wayleave Agreements for the erection or laying of electric lines and installation of Substation Plant.

The successful candidates for the above appointments will be required to contribute to the C.E.A. and Area Boards' Superannuation Scheme, if eligible.

Applications for the above posts on forms obtainable from the Sub-Area Secretary, 7 Oxford Rd, Newbury, and returned to him, in envelopes suitably endorsed, not later than 5 Aug., 1955. (T 559)

THE NORTH WESTERN ELECTRICITY BOARD

SENIOR ASSISTANT, DISPLAY SECTION, CHIEF COMMERCIAL OFFICER'S DEPARTMENT, AREA BOARD HEADQUARTERS, MANCHESTER

APPLICANTS should be experienced in Contemporary Showroom Planning, Layout and Decor, and be able to visualise and prepare rough sketches of Exhibition Layouts and Window Display Work.

Salary Scale: £645 x £25—£720 per annum, Grade 4, N.J.C. Conditions.

Applications to the Establishment Officer, The North Western Electricity Board, Cheetwood Rd, Manchester 8, by 13 Aug., 1955.

FOURTH ASSISTANT ENGINEER, SUB-AREA TECHNICAL ENGINEER'S DEPARTMENT, MANCHESTER

Applicants should have experience of general testing work, but more particularly protective equipment. The successful applicant will be required to supervise commissioning tests of protective equipment in substations, and should have had experience in the Testing Department of an Electricity Undertaking.

Preference will be given to applicants who hold the H.N.C. in Electrical Engineering, or its equivalent, and experience in a manufacturer's works will be an additional qualification.

Salary Scale: £715 x £15—£760 per annum, Grade L.13, N.J.B. Conditions.

Applications to Sub-Area Secretary, No. 1 Sub-Area, The North Western Electricity Board, Town Hall, Manchester, P.O. Box 493, by 30 July, 1955.

FOURTH ASSISTANT ENGINEER, SUB-AREA TESTING STATION, WALKDEN

Applicants should have had experience in the testing and installation of industrial metering equipments, the testing of instruments (including standardisation), protective gear equipment and Rhythmatic control, high voltage testing of cables, transformers and switchgear. The successful candidate will be required to work as necessary throughout the Sub-Area.

Membership of the Institution of Electrical Engineers will be an advantage.

Salary Scale: £715 x £15—£760 per annum, Grade L.13, N.J.B. Conditions.

Applications to Sub-Area Manager, No. 2 Sub-Area, The North Western Electricity Board, 2 St. George's Rd, Bolton, by 30 July, 1955.

SENIOR DRAUGHTSMAN, SUB-AREA MAINS ENGINEER'S DEPARTMENT, PRESTON

Applicants should have experience in the preparation of substation layouts, electrical apparatus plans, including overhead line details, and electrical diagrams.

The possession of a technical certificate in Electrical or Mechanical Engineering will be an advantage, and the applicant should be capable of supervising engineering draughtsmen.

Salary Scale: £640 x £20—£740 per annum, Schedule D, Grade 5, N.J.B. Conditions.

THIRD ASSISTANT DISTRICT ENGINEER, NORTH-WEST FYLDE DISTRICT, FLEETWOOD

Duties will include the operation, maintenance and construction of underground and overhead mains, substations, and transformers, and general mains work including standby duties. Applicants should state their experience in high voltage mains work.

Possession of the H.N.C. in Electrical Engineering will be an advantage.

Salary Scale: £675 x £15—£720 per annum, Grade F.9, N.J.B. Conditions.

ENGINEERING DRAUGHTSMAN, NORTH-WEST FYLDE DISTRICT, FLEETWOOD

Applicants should preferably have experience in the preparation of electrical network diagrams and the layout and construction of substations. The possession of a technical certificate in electrical or mechanical engineering will be an advantage.

Salary Scale: £510 x £20—£630 per annum, Schedule D, Grade 6, N.J.B. Conditions.

Applications for the above posts to Sub-Area Manager, No. 4 Sub-Area, The North Western Electricity Board, 40/41 Lune St, Preston, by 30 July, 1955. (T 548)

CENTRAL ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London Allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. for posts (*a*) and Corporate Membership for posts (*b*) an advantage.

(*b*) STATION SUPERINTENDENT BLACKWALL POINT GENERATING STATION

Vacancy No. 55/548

Applicants should have had a wide experience of Power Station operation, maintenance and administration, and should have a lively sense of responsibility in Management/Employee relations.

Salary—N.J.M. and H.E. Scale, £1,300/£1,450 (inclusive) per annum.

(*b*) DEPUTY STATION SUPERINTENDENT BOW GENERATING STATION

Vacancy No. 55/549

Applicants should have a sound technical training and organising ability, and wide experience in the efficient operation and maintenance of Power Station plant. A lively sense of responsibility in Management/Employee relations essential.

Salary—Class F, Grade 3, £1,023. 15s. per annum.

(*b*) BOILER HOUSE SUPERINTENDENT DEPTFORD WEST GENERATING STATION

Vacancy No. 55/550

Applicants should have received a sound mechanical and electrical engineering training with a first class technical background. A wide experience necessary in the efficient operation and maintenance of a large modern generating plant and auxiliary equipment, together with ability to plan and organise work to a strict time schedule. A lively sense of responsibility in Management/Employee relations essential.

Salary—Class J, Grade 6, £1,023. 15s. per annum.

(*a*) SHIFT CHARGE ENGINEER GLAUCAS ST. (POPLAR) GENERATING STATION

Vacancy No. 55/551

Sound technical training with practical experience of operation and control of Boilers, Turbines and Switchgear.

Salary—Class D, Grade 7, £708. 15s. per annum.

(*a*) ASSISTANT ENGINEER (TECHNICAL) LOMBARD ROAD GENERATING STATION

Vacancy No. 55/552

Applicants should have sound technical training and be conversant with preparation of routine Operating Returns—Knowledge of instrument maintenance an advantage.

Salary—Class F, Grade 12, £582. 15s. per annum.

(*a*) ASSISTANT ENGINEER (SHIFT) BARKING "A" AND "B" GENERATING STATIONS

Vacancy No. 55/553

Experience necessary in the operation of E.H.T. switchgear, station auxiliaries and the control of large turbo-alternators. The duties of the successful applicant will be those of First Assistant to the Station Shift Control Engineer in charge of the Control Room.

Salary—Class L, Grade 12, £792. 15s. per annum.

Applications, quoting vacancy number, may be made on form obtainable from Divisional Secretary, Central Electricity Authority, London Division, P.O. Box 136, Generation House, Great Portland St. W.1, and be received within 14 days of this advertisement. (T 552)

YORKSHIRE ELECTRICITY BOARD

No. 4 (Leeds) Sub-Area

THIRD ASSISTANT ENGINEER (DISTRIBUTION DESIGN)

APPLICANTS should have experience in the construction and design of overhead and underground networks and substations in Urban and Rural areas, and the preparation of technical reports.

Applicants should be Graduate Members of the Institution of Electrical Engineers or have equivalent qualifications.

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Salary—N.J.B. Class L, Grade 10, £840/£20/£900 per annum.

Leeds District

SECOND ASSISTANT DISTRICT ENGINEER

Applicants should be Corporate Members of the Institution of Electrical Engineers, or hold equivalent qualifications. They must have wide experience of a large city network in construction, operation and particularly in the preparation and design of schemes covering H.V. and M.V. overhead and underground distribution, together with substation equipment. Experience in the changeover of non-standard A.C. systems will be an added advantage.

Salary—N.J.B. Class K, Grade 6, £1,035/£30/£1,125 per annum.

THIRD ASSISTANT DISTRICT ENGINEER

Applicants should be Graduates of the Institution of Electrical Engineers or hold equivalent qualifications, and must have had experience in construction, operation and maintenance of overhead and underground distribution systems including substation equipment operating at voltages up to and including 11 kV.

The successful candidate will be expected to organise and control maintenance, supervise construction work, carry out operational duties and prepare schemes for reinforcements and extensions in a densely developed industrial and residential area.

Applicants must be prepared to reside within the District and also to undertake standby duties.

Salary—N.J.B. Class K, Grade 9, £840/£20/£900 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 4 (Leeds) Sub-Area, Yorkshire Electricity Board, Bramhope, near Leeds, not later than 4 Aug., 1955.

No. 5 (Wakefield) Sub-Area

SENIOR ASSISTANT (BILLING AND RENTALS)

Applicants should have a thorough knowledge of billing procedure in respect of domestic, commercial and industrial consumers and the maintenance of hire-purchase control. They should be conversant with punched card methods of billing and have experience in the supervision of staff.

The possession of an accountancy qualification will be an advantage.

Salary—N.J.C. Grade 6, £795/£25/£870 per annum.

THIRD ASSISTANT ENGINEER (OPERATION AND MAINTENANCE)

Applicants should have had a sound training and practical experience of general distribution work. Experience of substation maintenance work at 33 and 66 kV will be an advantage. The successful candidate will be required to live in the Castleford locality and to undertake standby duties.

Salary—N.J.B. Class K, Grade 10, £790/£20/£850 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a Denby Dale Rd, Wakefield, not later than 4 Aug., 1955.

No. 6 (Hull) Sub-Area

Bridlington District

FOURTH ASSISTANT DISTRICT ENGINEER

Applicants should be Graduate Members of the Institution of Electrical Engineers or hold equivalent qualifications, and have had experience in the construction, operation and maintenance of E.H.T. and L.T. overhead and underground distribution systems, in a mixed Urban and Rural District.

The successful applicant will be required to reside in Bridlington and to undertake standby duties.

Salary—N.J.B. Class E, Grade 11, £555/£15/£600 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees should be forwarded to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Kingston-upon-Hull, not later than 4 Aug., 1955. (T 547)

LONDON ELECTRICITY BOARD

SENIOR AND ENGINEERING DRAUGHTSMEN

APPLICATIONS are invited for the following vacancies. These posts are permanent and superannuable and they are graded under Schedule D of the National Joint Board agreement.

ENGINEERING DRAUGHTSMEN

Commencing salaries dependent upon qualifications and experience within Grade 6, £535. 10s./£661. 10s. per annum, inclusive of London Allowance.

South Eastern Sub-Area

DESIGN AND PLANNING BRANCH
(AT WOOLWICH, S.E.18)

Vacancy No. V/1973/T

Applicants should have had a good general and technical education in building construction and architecture, and experience in the design of small buildings in brickwork and reinforced concrete and the drawing up of specifications.

Hampstead/Willesden District

(DESIGN AND PLANNING)

Vacancy No. V/1972/T

Applicants should have had a good general and technical education in electrical engineering and building construction, and experience in a mains records office dealing with systems of all voltages up to 11 kV.

North Eastern Sub-Area

(BASED AT STRATFORD, E.15)

Vacancy No. V/1971/T

Candidates should have had a good general and technical education and be experienced in one or more of the following subjects: engineering drawing; plant layout in substations; layouts and site plans of mains work; electrical diagrams.

St. Marylebone/St. Pancras District

(DESIGN AND PLANNING)

Vacancy No. V/1967/T

Applicants should have had a good general and technical education in electrical engineering and building construction, and experience in a mains records office dealing with systems of all voltages up to 11 kV.

Western Sub-Area

(AT ECCLESTON PLACE, S.W.1)

Vacancy No. V/1947/T

Candidates must have had a good general and technical education up to National Certificate standard, and must be neat draughtsmen. They should be conversant with the layout of switchgear and transformers and associated equipment up to 11 kV for small substations. They should also be conversant with electrical diagrams, mains records, and similar work. Those with good experience in surveying and planning of mains networks would be considered even if having little experience of substation layouts.

Southern Sub-Area

(BASED AT BECKENHAM, KENT)

Vacancy No. V/1980/T

Candidates should have had a good general and technical education up to Ordinary National Certificate standard, be neat and capable draughtsmen and experienced in one or more of the following subjects: drawing office routine, electrical diagrams, layout of plant in transformer chambers, mains survey and recording of mains work.

Chief Engineer's Department

(AT STAMFORD ST., S.E.1)

Vacancy No. V/1989/T

Candidates should be experienced in surveying E.H.V. cable routes and have had good experience in making accurate surveys of cable routes during the laying of E.H.V. cables, taking information and sketches on site and producing final drawings.

Chief Engineer's Department

(AT STAMFORD ST., S.E.1)

Vacancy No. V/1989/T

Applicants, required for plant layout, should preferably have served an engineering apprenticeship and have had technical training to Ordinary National Certificate level, together with experience in the layout of

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transforming plant, H.V. switchgear and cables up to 66 kV. (In this instance an appointment may be made within Grade 5, £672/£777 per annum inclusive.)

SENIOR DRAUGHTSMEN

Commencing salaries dependent upon qualifications and experience within Grade 5, £672/£777 per annum, inclusive of London Allowance.

Southern Sub-Area

(BASED AT BECKENHAM, KENT)

Vacancy No. V/1979/T

Candidates should have had a good general and technical education and be experienced in one or more of the following subjects: building and civil engineering design, engineering drawing, plant layout in substations. In addition the applicant should be capable of supervising Engineering Draughtsmen and/or Junior Draughtsmen, if required.

Contracting Section

(AT STRATFORD PLACE, W.1)

Vacancy No. V/1986/T

Applicants should be capable of completing layouts of plant and associated cabling for large industrial installations.

Hampstead/Willesden District

(AT HAMPSTEAD, N.W.3)

Vacancy No. V/1998/T

Applicants should have had a good general and technical education in electrical engineering and building construction, and experience in a mains records office dealing with systems of all voltages up to 11 kV. In addition, the applicant should be capable of supervising Engineering Draughtsmen and/or Junior Draughtsmen, if required.

St. Marylebone St. Pancras District

(AT AYBROOK ST, W.1.)

Vacancy No. V/2001/T

Applicants should have had a good general and technical education in electrical engineering and building construction, and experience in a mains records office dealing with systems of all voltages up to 11 kV. In addition, the applicant should be capable of supervising Engineering Draughtsmen and/or Junior Draughtsmen, if required.

Application forms for the foregoing vacancies are obtainable from the Personnel Officer, 46/7 New Broad St, London, E.C.2. Please enclose addressed envelope and quote reference No. of vacancy preferred.

(T 351)

CHIEF INSPECTOR (ELECTRICAL)

required by the Public Works Department, Tanganyika, for appointment on probation for permanent employment. Normal tour 2-3 years. Salary scale (including inducement pay and present 10% temporary allowance) £1,320 rising to £1,498 a year. Outfit allowance £45 payable in certain circumstances. Free passages. Liberal leave on full salary. Candidates, aged 30 to 40, must hold C. and G. Final Certificate in Electrical Installation Work or O.N.C. in Electrical Engineering. They must have served an apprenticeship and have had at least five years' subsequent experience in electrical installation work in public buildings and factories. A knowledge of refrigeration plant would be an advantage. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2A/41083/EE. (T 540)

SOUTH WALES ELECTRICITY BOARD

require DISTRICT COMMERCIAL MANAGER, District 466 (Llandrindod Wells), Eastern Sub-Area.

Salary—Class C, Grade 2 (£840/£900) of the N.J.B. Schedule.

Applications stating age, present position, salary, qualifications, experience and three referees, should be addressed to the Secretary (Establishments Section), St. Mellons, to arrive by 30 July, 1955.

D. G. DODDS,
Secretary.

St. Mellons,
Cardiff. (T 550)

SOUTH OF SCOTLAND ELECTRICITY BOARD

Glasgow Area

APPLICATIONS are invited for the appointment of SECOND ASSISTANT ENGINEER (CONSTRUCTION) in the above area.

Applicants should have received a sound theoretical and practical training in heavy current electrical engineering and be capable of taking charge, under the general guidance of the Senior Assistant Engineer (Construction), of the erection and commissioning of sub-stations and laying of cables, up to 33 kV, throughout the Glasgow Area. Some experience of building construction and general drawing office work would be an advantage.

Salary—N.J.B. Class K, Grade 7 (£975/£1,050 per annum).

There is a possibility of a higher classification in the near future.

The appointment is superannuable and may be subject to medical examination

The successful candidate will be required to reside within reasonable distance of the Area Headquarters.

Form of application, which may be obtained from the undersigned, should be completed and returned not later than 12 August, 1955.

A. KELSO,
Manager.

P.O. Box 6,
75 Waterloo St,
Glasgow C.2. (T 551)

CENTRAL ELECTRICITY AUTHORITY

North West, Merseyside & N. Wales Division

VACANCY No. E.188/259/T.—ASSISTANT SHIFT CHARGE ENGINEER, Carrington Generating Station, near Manchester. Salary £755/£800 (H.9).

Vacancy No. E.188/260/T.—ASSISTANT ENGINEER (BOILER HOUSE) at Ribble Generating Station, Preston. Salary £715/£760 (H.10). The successful applicant will be required to assist in the control of operation in two Boiler Houses. Combustion experience essential.

Vacancy No. E.188/261/T.—STATION SHIFT CONTROL ENGINEER at Roosecote Generating Station, Barrow-in-Furness. Salary £675/£720 (G.10).

Closing date—30 July

Vacancy No. E.188/257/T.—GENERAL ASSISTANT ENGINEERS in power stations in North West England, particularly Merseyside and Greater Manchester areas. Salary £515/£560. Applicants should have served recognised apprenticeship and have attained at least O.N.C. in Elec. or Mech. Engineering. Fundamental knowledge of electro technology essential.

Applications, quoting Vacancy No., to Divisional Secretary, Central Electricity House, 825 Wilmslow Rd, Manchester 20. (T 549)

SOUTH OF SCOTLAND ELECTRICITY BOARD

Edinburgh Area

APPLICATIONS are invited for the following vacancies:

THIRD ASSISTANT ENGINEER, METER TEST DEPARTMENT

The duties will include assisting the Meter Engineer in running a Class "A" Test Station, and testing and commissioning of H.V. and M.V. Industrial metering.

Technical qualifications should be up to H.N.C. Standard in Electrical Engineering.

Salary Scale: Class J, Grade 10, £755 x £15—£800 per annum.

GENERAL ASSISTANT ENGINEERS

The duties will be to assist in the Construction, Operation and Maintenance of Substation equipment and underground networks up to 33 kV.

Salary Scale: Class I, Grade 17, £475 x £15—£520 to Class J, Grade 14, £595 x £15—£640 per annum. According to age and experience.

The appointments are superannuable, and subject to Medical Examination.

Application Forms which may be obtained from the undersigned, should be forwarded to this office within 14 days of the date of this advertisement.

G. T. ALLCOCK,
Area Manager.

Dewar Place,
Edinburgh 3. (T 544)

AIR MINISTRY

require STATION ENGINEERS (G.D.) and STATION ENGINEERS (MECH.) at Royal Air Force and Ministry of Transport and Civil Aviation stations. Qualifications required (*a*) Ordinary National Certificate in Electrical or Mechanical Engineering or show that an equivalent standard of technical education has been reached. (*b*) recognised apprenticeship in electrical or mechanical engineering with firm or establishment of good repute, (*c*) three years' employment in electrical or mechanical engineering preferably on operation and maintenance of mine, factory or workshop plant and services. Preference will be given to applicants who have had supervisory duties subsequent to (*b*) and (*c*). Work will consist of installation, operation and maintenance of high and medium voltage electrical distribution systems, electrical installations, generating plant, steam and hot water heating systems and miscellaneous works plant, tools and equipment. Commencing salary according to age, qualifications and experience on range from £535/£772. Liability for tours of duty overseas for which special allowance payable in addition to higher salary. Appointments non-pensionable and experience to AB.1255, Appointments Officer, Ministry of Labour and National Service, 1-6 Tavistock Sq, W.C.1. No original Testimonials should be sent. Only candidates selected for interview will be advised. (T 409)

CHINA LIGHT AND POWER CO., LTD.

Kowloon, Hong Kong

ASSISTANT ENGINEER,
DISTRIBUTION DEPARTMENT

APPLICATIONS are invited for the above position from suitably-qualified engineers, preferably aged 30 to 35 years.

Applicants must have sound theoretical training and practical experience in the installation and maintenance of high and low voltage underground and overhead mains, static substation plant and distribution equipment.

The Company operates only in the Crown Colony of Hong Kong, using modern British equipment, and the position offered is progressive for a capable and experienced man.

Commencing salary is $1,650 per month, rising by annual increments of $35 to $2,000, with High Cost of Living Allowance which varies in accordance with the Local Government Retail Price Index, the present allowance being:

Single Men, $466·20 p.m.; Married Men, $699·30 p.m.; Married Men with children, $932·40 p.m.

In addition, there is an Expatriation Allowance of $306·67. The average value of Hong Kong Dollar is 1s. 2-13/16d.

An Employees' Provident Scheme is in operation, and also a Retiring Fund, qualification for the latter being twenty years' service and age 55.

First-class unfurnished quarters are provided or alternative accommodation, also free passage out (P. and O. 2nd class) and return passage after completion of contract.

The successful applicant will be required to pass a medical examination.

Apply giving full particulars and when available to—Box No. A52, T. and G., 167 High Holborn, London, W.C.1. (T 546)

LECTURER

Electrical Trades

required for the Government Technical Institute, British Guiana, for appointment on contract for three years in first instance. Commencing salary, according to experience in salary scale £770 rising to £1,200 a year. Gratuity at the rate of £173/£270 a year. Free passages. Liberal leave on full salary. Candidates must hold a City and Guilds Full Technological Certificate or H.N.C. in Electrical Engineering and have at least five years' industrial experience including electrical installation work. Write to the Crown Agents, 4 Millbank, London, S.W.1 State age, name in block letters, full qualifications and experience and quote M2A/30229/EE. (T 524)

CENTRAL ELECTRICITY AUTHORITY

South Wales Division

Vacancy No. 78/55

APPLICATIONS are invited for superannuable N.J.B. appointments in the Drawing Office, Construction Department, Divisional Headquarters.

(*a*) SENIOR DRAUGHTSMAN (Electrical).
Salary: Schedule D, Grade 5, £640/£740 per annum.

(*b*) ENGINEERING DRAUGHTSMAN (Electrical).

(*c*) ENGINEERING DRAUGHTSMAN (Civil).

(*d*) ENGINEERING DRAUGHTSMAN (Mechanical).
Salary: Schedule D, Grade 6, £510/£630 per annum.

Candidates should be suitably qualified and have had experience for (*a*) and (*b*) in the preparation of layouts and diagrams for the installation of Power Station auxiliaries, E.H.T. and L.T. switchgear, transformers and cables. Knowledge of protective gear systems advantageous.

For (*c*) designing or detailing reinforced concrete structures, structural steelwork and general building construction such as are associated with heavy industrial work.

For (*d*):

(i) Design and layout of Power Station equipment, including turbo-alternators, boiler plant, coal and ash plant and general station auxiliaries.

(ii) H.P. and L.P. Steam and Feed pipework, condensing plant and feed heating systems.

(iii) Conveyor plant, coal-handling systems and material handling of Station auxiliary equipment.

Application forms obtainable from Secretary, South Wales Division, Central Electricity Authority, Twyn-y-Fedwen Rd, Gabalfa, Cardiff, to be returned by 30 July, 1955. (T 541)

CENTRAL ELECTRICITY AUTHORITY

South Eastern Division

1. FIRST ASSISTANT STATION CHEMIST—Croydon "A" and "B" Power Stations. Applicants should preferably possess B.SC. Degree or equivalent qualification and have had experience in fuel testing, water analysis and lubricating oil testing. Experience of modern Power Station installations an advantage. Class K, Grade 9, £840/£900 per annum.

2. GENERAL ASSISTANT ENGINEER (Control)—Croydon "B" Power Station. Applicants should preferably have had experience in the operation of E.H.T. switchgear and the parallel running of alternators. Class J, Grade 17, £475/£520 per annum.

3. ASSISTANT ENGINEER (Operation and Efficiency)—Littlebrook Power Station. Applicants, who should preferably possess an Engineering Degree or similar qualification, will be required to assist the Station Operation and Efficiency Engineer in the examination of station performances and the determination of station operation and maintenance policy, and will be responsible for the control of staff dealing with the day to day work relating to station efficiency. Class L, Grade 8, £975/£1,050 per annum.

4. FOURTH ASSISTANT ENGINEER—Divisional Headquarters, Kingston. Applicants should preferably possess an Engineering Degree and have had some Power Station experience on either mechanical or electrical engineering. Class AX/DX, Grade 6, £600/£725/£785.

All salaries subject to addition of London Allowance.

Written applications giving details of education, present position, experience, etc., should be sent to the following:

1 and 2.—Station Superintendent, Croydon "B" Power Station, Beddington Farm Rd, Croydon, Surrey.

3.—Station Superintendent, Littlebrook Power Station, Near Dartford, Kent.

4.—Establishments Officer, Central Electricity House, Lower Ham Rd, Kingston-upon-Thames, Surrey. (T 578)

EAST ANGLIAN REGIONAL HOSPITAL BOARD

(1) SENIOR ASSISTANT ENGINEER (Mechanical)—Candidates to be experienced in design and installation of heating, ventilating, steam boiler plant and services, etc., and must be A.M.I.MECH.E., or equivalent. Salary £900 x £30—£1,050 per annum.

(2) ASSISTANT ENGINEER (Mechanical)—Candidates to be experienced in the work at (1) and should be A.M.I.H.V.E. or Graduate Members of the I.H.V.E. or equivalent. Salary £625/£890 per annum.

(3) ASSISTANT ENGINEER (Electrical)—Candidates to be experienced in design and installation of electrical engineering services and should be A.M.I.E.E., or Graduate Members of I.E. or equivalent. Salary £625/£890 per annum.

(4) ENGINEERING ASSISTANTS—Candidates to be experienced in work described above and possess Ordinary National Certificate (Mechanical or Electrical). Salary £465 (at age 21 or over)—£650 per annum.

(5) DRAUGHTSMEN (Engineering)—Candidates to have had suitable training and experience. Salary £380 (at age 21 or over)—£570 per annum.

Additional increments within the scale based on experience and age may be granted in respect of posts (2) and (3). Commencing salary for post (4) may be fixed at point above minimum, but will not exceed £550 per annum. The above salary scales are at present under review.

Applications indicating appropriate post and stating age, qualifications, experience and details of present position with names of three referees to Secretary of Board, 117 Chesterton Rd, Cambridge, by 2 Aug., 1955. (T 491)

SOUTH WESTERN ELECTRICITY BOARD

ASSISTANT—WAYLEAVES

at Taunton Sub-Area Headquarters—Taunton

SALARY: N.J.C. Grade 2—£525/£585 per annum.

The successful candidate will be responsible, under the Senior Assistant, Wayleaves, for the maintenance of all Wayleave records (and duties ancillary thereto) and records of the Board's properties within the Sub-Area; for checking applications for the consent of the Ministry of Fuel and Power, and for assisting in obtaining wayleaves throughout the Sub-Area, when required.

Possession of a current driving licence is desirable.

Application forms obtainable from the Manager, Taunton Sub-Area, Electricity House, The Parade, Taunton, should be returned by 4 Aug., 1955. (T 563)

SOUTH EASTERN ELECTRICITY BOARD

SECOND ASSISTANT COMMERCIAL ENGINEER
East Sussex and South West Kent Sub-Area Headquarters.

SALARY £840 x £20—£900 under N.J.B. Class H, Grade 7. Superannuable. Applicants who should be suitably-qualified will be responsible for encouraging the utilisation of electricity in farming and horticulture, and should have sound training and experience in this type of work.

Applications to N. Boydell, M.I.E.E., A.M.I.MECH.E., Manager, East Sussex and South West Kent Sub-Area, SEEBoard, Westlords, Willingdon Rd, Eastbourne, by 6 Aug., 1955.

DISTRICT COMMERCIAL ENGINEER
Tunbridge Wells District

Salary £900 x £25—£975 per annum under N.J.B. Class F, Grade 4. Superannuable. Applicants must be qualified engineers with experience in a large district commercial department, conversant with tariffs, showrooms, sales, commercial statistics, installation work and all aspects of service to domestic, commercial and agricultural consumers. The person appointed will be responsible for the Department.

Applications, naming 2 referees, to T. W. Dann, M.ENG., M.I.E.E., Tunbridge Wells District Managers, SEEBoard, Town Hall, Tunbridge Wells, by 6 Aug., 1955.

A. L. BURNELL,
Secretary.
(T 562)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:

ASSISTANT in the Secretary's Department for administrative duties in connection with the Board's training activities.

The lady appointed will be required to undertake responsibility for the day to day administration of Courses at the Board's Training Centres near Bromsgrove, Worcestershire.

A suitably-qualified person may from time to time be required to undertake instruction in certain subjects and domestic science training and sales experience is an advantage.

Salary £585/£645 per annum (N.J.C. Grade 3).

Applications stating details of age, education, training, qualifications, experience and present position and salary should be forwarded to the Secretary (Ref.: FWC), Midlands Electricity Board, Mucklow Hill, Halesowen, Nr. Birmingham.

Central Gloucestershire Sub-Area

GENERAL ASSISTANT DISTRICT ENGINEER
SEVERN VALE DISTRICT

Applicants should have had a sound technical training and experience in the construction, operation and maintenance of overhead and underground systems. Technical qualifications desirable. Salary £595/£640 per annum (N.J.B. Class E, Grade 10).

Apply, in writing, within fourteen days, stating age, qualifications and experience, present position and salary to Mr F. F. Freeling, District Manager, Midlands Electricity Board, Bowling Hill, Chipping Sodbury, Bristol.

THIRD ASSISTANT DISTRICT ENGINEER
SEVERN VALE DISTRICT

Applicants should have had a sound technical training and experience in the construction, maintenance and operation of overhead and underground systems and substations.

Technical qualifications desirable. Salary £635/£680 per annum, Grade 9, Class E, N.J.B.

Apply, in writing, within fourteen days, stating age, experience, present position and salary to Mr S. Raybould, Sub-Area Manager, Midlands Electricity Board, 126 London Rd, Gloucester.

Shropshire and Herefordshire Sub-Area

SECOND ASSISTANT DISTRICT ENGINEER

in the following Districts:

1. Wellington, Salary £755/£800 (N.J.B. Grade F.7).
2. Hereford, Salary £715/£760 (N.J.B. Grade E.7).
3. Shrewsbury, Salary £715/£760 (N.J.B. Grade E.7).
4. Ludlow, Salary £675/£720 (N.J.B. Grade D.7).
5. Leominster, Salary £635/£680 (N.J.B. Grade C.7).

Applicants should have had a sound technical training and practical experience in the operation and maintenance of overhead and underground systems up to 44 kV. Protection Testing, Fault Location, etc. The successful candidates will be required to undertake standby duties. Technical qualifications desirable.

Apply, in writing, within fourteen days, stating age, qualifications, present position and salary, and indicating post for which application is being made, to Mr W. Winwood, Sub-Area Manager, Midlands Electricity Board, Spring Gardens, Shrewsbury.

A. STEPHENS,
Secretary.
(T 579)

HUNTINGDONSHIRE EDUCATION COMMITTEE

The Technical Institute, St. Neots

APPLICATIONS are invited for the position of LABORATORY STEWARD. Salary and conditions of service in accordance with N.J.C. scale, Misc. Grades II-III, £375/£435: £420/£485. Initial salary to be fixed according to qualifications and experience. Duties to commence 1 Sept., 1955. Form of application and particulars of duties may be obtained from the Head, Technical Institute, Almond Rd, St. Neots.
(T 577)

CENTRAL ELECTRICITY AUTHORITY

Southern Division

APPLICATIONS are invited for the following posts:

THIRD ASSISTANT ENGINEER (CABLES)
TRANSMISSION DEPARTMENT

S/13.692

Applicants should have experience in the design, installation, testing and maintenance of high voltage cables. Knowledge of the manufacture of high voltage cables will be an advantage. Candidates should be corporate members of an appropriate professional institution, or hold qualifications leading to such membership.

Salary: N.J.B. AX/CX, Grade 4, £750/£925.

FOURTH ASSISTANT ENGINEER
TRANSMISSION DEPARTMENT

S/13.693

Applicants should have had some experience in the construction of high voltage transmission lines with practical experience of the surveying and profiling of such lines. Candidates should possess a Higher National Certificate or its equivalent, and preference will be given to those studying for qualifications leading to corporate membership of an appropriate professional institution.

Salary: N.J.B. AX/CX, Grade 6, £600/£765.

GRADE 10 ENGINEER
POOLE GENERATING STATION

S/13.694

The successful candidate may be called upon to perform the duties of a station shift control engineer, to assist on maintenance work, or to perform general station duties. Operating experience of modern generating station plant is essential.

Applicants should have had a sound technical training and should possess qualifications leading to corporate membership of an appropriate professional institution.

Salary: N.J.B. Grade J.10, £755/£800.

WAYLEAVE OFFICERS

S/13.695

Applicants should be of good education, and have experience of negotiating with landowners and public and other authorities to arrange wayleaves in connection with overhead transmission lines, including settlement of claims for damage to crops, etc. Some knowledge of timber valuation and estate management, and of office organisation is desirable. Candidates should be car drivers. The posts are temporary, but the engagements will be for a minimum period of 2 years.

Salary: N.J.C. Grade 4, £645 x £25—£720.

Special application forms for each of the above posts, obtainable from P. D. A. Oliver, Divisional Secretary, 111 High St, Portsmouth, should be returned by 4 Aug., 1955. Please quote reference E.T. MA/NMH/140.

15 July, 1955. (T 576)

SOUTH OF SCOTLAND ELECTRICITY BOARD

Ayrshire Area

GENERAL ASSISTANT DISTRICT ENGINEERS

APPLICATIONS are invited for appointments as General Assistant District Engineers in the undernoted Districts.

The salaries and conditions of service will be in accordance with the National Joint Board Agreement.

District	*Classification and Grading*	*Salary*
Ayr	E.11	£555/£600 p.a.
Kilmarnock	E.11	£555/£600 p.a.
Ardrossan	E.11	£555/£600 p.a.
Ardrossan	E.13	£475/£520 p.a.

Applicants should possess as a minimum technical qualification, the Ordinary National Certificate in Electrical Engineering.

The successful candidates will require to reside within reasonable distance of their respective District Offices.

Applications Forms, which may be obtained from the undersigned or any other Area Manager, should indicate the District preferred and be lodged with me not later than 29 July, 1955.

A. E. ROOTS,
Manager.

Greenholm St,
Kilmarnock.
13 July, 1955. (T 560)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments which are superannuable and subject to medical examination:

1. ENGINEERING DRAUGHTSMAN at the Headquarters of the Board, Electricity House, Love Lane, Liverpool 3. Salary within the range £510/£630 per annum (N.J.B. Schedule D/6).

Applicants should preferably have experience in the general design and layout of indoor and outdoor substations up to 33 kV, cable layouts and diagrams of connections, and should preferably have reached the Ordinary National Certificate (Electrical Engineering) standard.

Application forms obtainable from the Establishments Officer at the above address. Closing date 2 Aug., 1955.

2. ASSISTANT SECTION ENGINEER (OPERATION) in the No. 4 Sub-Area to be based at Crewe. Salary £675/£720 per annum (N.J.B. F/9).

3. ASSISTANT SECTION ENGINEER in the No. 4 Sub-Area Clywd District based on Rhuddlan. Salary £635/£680 per annum (N.J.B. E/9).

For Posts 2 and 3, duties include the construction, maintenance and operation of h.v. and m.v. overhead and underground systems.

4. FOREMEN in No. 4 Sub-Area to be based on Welshpool. Salary £595 per annum (Grade 2, Schedule E, N.J.I.C. Agreement).

Applicants should have had experience in the control of staff engaged on construction of E.H.T. and L.T. overhead and underground mains.

For Posts 2, 3 and 4, application forms obtainable from the Manager, No. 4 Sub-Area, Electricity House, Rhostyllen, near Wrexham. Closing date 2 Aug., 1955.
(T 545)

COUNTY BOROUGH OF WEST HAM

EDUCATION COMMITTEE

West Ham College of Technology,
Romford Rd, Stratford, E.15.
Principal:
E. A. Rudge, PH.D., M.SC., A.M.I.CHEM.E.

REQUIRED: ASSISTANT, Grade B, in Electrical Engineering Department for Ordinary and Higher National Certificate Courses. University Degree and industrial experience in Electrical Machinery or Power desirable.

Salary: Burnham Technical Scale (London).

Application forms and particulars obtainable from the Principal (s.a.e.).

R. OPENSHAW,
Chief Education Officer.

Education Offices,
95 The Grove,
Stratford, E.15. (T 566)

CENTRAL ELECTRICITY AUTHORITY

South Western Division

TECHNICAL STAFF VACANCIES

(*a*) ASSISTANT MAINTENANCE ENGINEER (Electrical) — Portishead "A" Power Station. N.J.B. J.8, £840/£900.

(*b*) ASSISTANT ENGINEER (Handling)—Newton Abbot Power Station. N.J.B. F.11, £595/£640.

Superannuation.

(*a*) Applicants should have had a sound practical and technical training. Corporate Membership of the I.E.E. or equivalent an advantage. Previous experience in Power Station electrical maintenance work desirable.

(*b*) Duties will mainly be in connection with Coal Stocking, Coal Movements and Ash Disposal. Previous experience of similar duties an advantage.

Applications on Form A.E.6/ACT, obtainable from the Divisional Secretary, 26 Oakfield Rd, Bristol 8, should be completed and returned by 6 Aug., 1955.
(T 561)

CENTRAL ELECTRICITY AUTHORITY
Midlands Division

APPLICATIONS are invited for the following positions in the Generation Operation Department. N.J.B. service conditions, superannuable appointments, salaries within Schedule A of the Agreement:

(*a*) OPERATION AND EFFICIENCY ENGINEER at Meaford "B" Power Station, Grade G5, £900/£975 per annum. (Vacancy No. 3MD.)

(*b*) ASSISTANT MAINTENANCE ENGINEER (Electrical) at Meaford "B" Grade G8, £755/£800 per annum. (Vacancy No. 4MD.)

(*c*) SHIFT CHARGE ENGINEER at Nechells "A" Power Station, Grade F7, £755/£800 per annum. (Vacancy No. 5MD.)

Applicants for these positions should have had sound technical training, and in particular for (*a*) wide experience of the operation and maintenance problems arising in a modern power station; the successful applicant will be responsible to the Station Superintendent for the efficiency of the power station plant; sound experience is required for (*b*) in modern power station electrical maintenance, and for (*c*) in the operation of steam generating plant and main switchgear. Appropriate technical qualifications an advantage.

Apply, quoting the vacancy number, on form AE6, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 6 Aug., 1955. (T 582)

CENTRAL ELECTRICITY AUTHORITY
East Midlands Division

APPLICATIONS are invited for the following positions within the Division:

SECOND ASSISTANT ENGINEER (CIVIL)
STAYTHORPE "B" POWER STATION
Vacancy No. 116/55/ET

The successful applicant will be required to assist in supervising the civil engineering and building work at Staythorpe "B" Power Station in collaboration with the Consulting Engineers.

Preference will be given to applicants who have a degree in Civil Engineering, are Corporate Members of the Institution of Civil Engineers or possess equivalent qualifications. They should have had experience in the administration of large Civil Engineering contracts, and be able to supervise the setting out and progress of the works, which include heavy pile foundations, culverts, structural steelwork, buildings and the like.

Salary will be in accordance with Class AX/DX, Grade 2 (£950/£1,165 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 4 Aug., 1955.

FOURTH ASSISTANT ENGINEER
(MECHANICAL)
NORTH WILFORD POWER STATION
Vacancy No. 115/55/ET

The successful applicant will be required to assist in supervising the installation of Generating Plant at North Wilford Power Station.

Applicants should have had a fundamental training in mechanical engineering, including workshops, and should preferably have had experience in the manufacture, erection, maintenance and operation of mechanical plant as installed in modern Power Stations. Preference will be given to candidates who possess a degree or are Graduate Members of the Institution of Mechanical Engineers.

Salary will be in accordance with Class AX/DX, Grade 6 (£600/£785 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 4 Aug., 1955.

GENERAL ASSISTANT ENGINEER
LEICESTER POWER STATION
Vacancy No. 114/55/ET

Duties will be in the Boiler House and Control Room. Qualifications up to Higher National Certificate standard would be an advantage.

Salary will be in accordance with Class H, Grade 16 (£475 x £15—£520 per annum) of the National Joint Board Agreement.

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Closing date for receipt of applications: 11 Aug., 1955.

SENIOR DRAUGHTSMAN (CIVIL)
CONSTRUCTION DEPARTMENT
Vacancy No. 122/55/ET

Candidates should have experience in the preparation of detail drawings and in the design of one or more of the following subjects:

Reinforced concrete structures,

Piled and Slab foundations for heavy components,

Cable subways, Bridges and Culverts.

The salary will be in accordance with Grade 4 (£750 x £20—£850 per annum) or Grade 5 (£640 x £20—£740 per annum) of Schedule D of the National Joint Board Agreement.

Closing date for receipt of applications: 11 Aug., 1955.

WAYLEAVE OFFICER
DIVISIONAL HEADQUARTERS
Vacancy No. 124/55/ET

Candidates should be of good education and have experience of negotiating with owners of property to arrange Wayleaves connected with the erection of overhead transmission lines, settlement of damage to crops, etc., during erection of lines.

Knowledge of tree cutting and valuation and Estate Management desirable.

The successful applicant will be required to provide a car for this appointment for which appropriate allowance will be made.

The salary will be in accordance with Grade 3 (£585/£645 per annum) of the National Joint Council Agreement.

Closing date for receipt of applications: 11 Aug., 1955.

SHIFT CHARGE ENGINEER
DRAKELOW POWER STATION
Vacancy No. 118/55/ET

Applications are invited from suitably-qualified engineers having had operating experience with large capacity high-pressure turbo-alternators and pulverised fuel-fired boilers.

Applicants should be in possession of technical qualifications admitting to Corporate Membership of the Institution of Electrical Engineers and/or the Institution of Mechanical Engineers.

Apprenticeship at a large manufacturing works will be an advantage.

Salary will be in accordance with Class J, Grade 7 (£900 x £25—£975 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 11 Aug., 1955.

These appointments will be pensionable within the terms and provisions of the Central Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form A.E.6/ACT which may be obtained from the Divisional Establishments Officer, Central Electricity Authority, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote Vacancy No.

L. F. JEFFREY,
Divisional Controller.
15 July, 1955. (T 567)

SOUTH OF SCOTLAND ELECTRICITY BOARD
Lothians Area

APPLICATIONS are invited for the following superannuable appointments. Conditions of service in accordance with the N.J.B. Agreement, Schedule A.

1. SENIOR ASSISTANT ENGINEER (Meters, Test and Protection) at Area Headquarters, Musselburgh. Salary scale £975/£1,050 per annum (N.J.B. G.4).

Applicants should have had experience in the testing and commissioning of electrical plant, on H.V. underground cable fault location and in protective gear and metering practice. Corporate Membership of the Institution of Electrical Engineers or other equivalent qualification is essential.

2. SENIOR ASSISTANT ENGINEER

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continued from previous column

(Operation and Maintenance) at Area Headquarters, Musselburgh. Salary scale £975/£1,050 per annum (N.J.B. G.4).

Applicants should have had experience in the operation and maintenance of urban and rural networks up to 33 kV. Corporate Membership of the Institution of Electrical Engineers or other equivalent qualification is preferable.

3. THIRD ASSISTANT ENGINEER (Operation and Maintenance) at Area Headquarters, Musselburgh. Salary scale £675/£720 per annum (N.J.B. G.10).

Applicants should have had experience in the operation and maintenance of urban and rural networks up to 33 kV. Possession of a Higher National Certificate in Electrical Engineering is preferable.

4. THIRD ASSISTANT ENGINEER —South District at Dalkeith. Salary scale £635/£680 per annum (N.J.B. E.9).

Applicants should have had experience in rural electricity distribution work. Possession of a Higher National Certificate in Electrical Engineering is preferable.

The successful candidate will be required to live within a reasonable distance of Dalkeith.

5. FOURTH ASSISTANT ENGINEER (Meters, Test and Protection) at Area Headquarters, Musselburgh. Salary scale £555/£600 per annum (N.J.B. G.13).

Applicants should have had a sound technical training and should hold a Higher National Certificate in Electrical Engineering or other equivalent qualification. Previous experience of protective gear work would be an advantage.

6. FOURTH ASSISTANT ENGINEER (Construction) at Area Headquarters, Musselburgh. Salary scale £555/£600 per annum (N.J.B. G.13).

Previous construction experience is desirable and applicants should possess as a minimum qualification the Ordinary National Certificate in Electrical Engineering.

Application forms, which may be obtained from the undersigned, should be lodged within fourteen days of the date of this advertisement.

G. F. MOORE,
Manager.
High St,
Musselburgh. (T 584)

SOUTH WESTERN ELECTRICITY BOARD

FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER, TAUNTON

SALARY: N.J.B. Class E, Grade 6, £755/£800 per annum.

The successful candidate will be required to assist the District Commercial Engineer in all commercial matters and deputise in his absence. Duties include the initiation of development schemes, sales and publicity campaigns, and the supervision of preparation of detailed wiring tenders.

Applicants should possess an all-round commercial and engineering experience and the ability to control staff. Qualifications leading to Corporate Membership of the I.E.E. will be an advantage.

Application Forms, obtainable from the District Manager, Electricity House, The Parade, Taunton, are to be returned by 4 Aug., 1955.

THIRD ASSISTANT DISTRICT ENGINEER
(OPERATION AND MAINTENANCE)
BARNSTAPLE

Salary N.J.B. Class D, Grade 8, £635/£680 per annum.

Duties are connected with the operation and maintenance of EHT and LV Mains and Plant. Applicants must have had some practical experience in the operation and maintenance of 33 kV, 11 kV and LV underground and overhead networks and substations. Possession of appropriate technical qualifications at least of H.N.C. standard and a current driving licence would be an advantage. Applicants should be prepared to reside in the Barnstaple District and undertake standby duties.

Application Forms, obtainable from the District Manager, 7 Cross St, Barnstaple, are to be returned by 4 Aug, 1955. (T 565)

CENTRAL ELECTRICITY AUTHORITY
Midlands Division

SHIFT CHARGE ENGINEER required at Ocker Hill Generating Station. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade F7, £755/£800 per annum.

A sound technical training and practical experience in the control and operation of steam generating plant and main switchgear is required. Appropriate qualifications an advantage.

Apply, quoting Vacancy No. 2 MD on form AE6 available from Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 6 Aug., 1955. (T 581)

NORTH EASTERN ELECTRICITY BOARD
York Sub-Area

APPLICATIONS are invited for the appointment of SECOND ASSISTANT ENGINEER (Operation and Maintenance) York. Salary Schedule A, Class G, Grade 7, £790/£850. N.J.B. Conditions of Service.

Applications stating age, qualifications and experience to be received by the Secretary (Establishments), the North Eastern Electricity Board, G.P.O. Box No. 117, Carliol House, Newcastle upon Tyne, within ten days of the appearance of this advertisement. (T 564)

A SKILLED ELECTRICAL FITTER/ARMATURE WINDER for assembly of wide range of electric motors, etc. Must have repair shop experience. Excellent prospects, Lewis Electric Motors Ltd., Moor Works, Maidenhead, Berks. (T 437)

A NUMBER of vacancies exist for CONSTRUCTION ENGINEERS, Assistants and Surveyors for Overhead Line Work throughout Scotland. Good prospects for suitable men. In certain cases experience in Substation construction would be an advantage but is not essential. Give full details, training, experience, age, etc., to Box No. 786, Keith and Co., Advertising Agents, 137 Princes St, Edinburgh. (T 497)

AN ENGINEER and a DRAUGHTSMAN are required by Consulting Engineers in Westminster for interesting and varied work. Good prospects for suitable applicants. Reply to—Box No. 4671, Electrical Times. (T 508)

A VACANCY has arisen in the Industrial Heating Department at the Head Office of The General Electric Co., Ltd., for an ADVERTISING AND PUBLICITY ASSISTANT. Applicants should be about 25-30 years of age and have had previous experience in the preparation of advertising matter, catalogues and technical literature. Some knowledge of electrical engineering will be an advantage. Apply in writing, quoting reference I.H. to the Staff Manager, Magnet House, Kingsway, London, W.C.2. (T 528)

APPLICATIONS are invited for the post of PROFESSOR, Electrical Engineering, Lahore, West Pakistan.

Salary: Rs. 1400 p.m. plus allowances, housing concessions and free passages. 1 R =2s. 2d. approximately.

Contract: 5 years in first instance. Provident Fund available.

Qualifications: Hons. Degree Electrical Engineering, Corporate Membership of the Institution of Electrical Engineers or equivalent, considerable practical and teaching experience. No restriction on nationality or domicile.

Age: 40-45, but older men considered.

Application forms and further particulars from the Recruitment Officer, Pakistan High Commission, 39 Lowndes Sq, London, S.W.1. (T 542)

AN INSTALLATION MANAGER required by a firm of Electrical Engineering Contractors in Ireland. Applicants should have a sound commercial and engineering training and be capable of handling small and large contracts from estimating stage to completion. Applications should state name, age, education, technical training and experience.—Box No. 4679, Electrical Times. (T 534)

A. REYROLLE AND COMPANY LTD. have a number of vacancies in their Research Department:

For University Graduates, preferably with Hons. Degree in Electrical Engineering of Physics, to undertake Research into problems relating to power systems, switchgear, protective gear, dielectric phenomena and insulating materials.

For men with a Pass Degree of H.N.C. to undertake general technical work and co-ordination of development testing relating to the above problems.

For men with H.N.C. or O.N.C. as Testing Engineers in the Electrical Laboratories. Young men with lower qualifications who have served a recognised Electrical Engineering Apprenticeship may be considered for training for this type of work.

Reyrolle are among the largest switchgear manufacturers in the world and their work covers a wide field. The appointments advertised are in accordance with usual staff conditions, including superannuation, and offer interesting work with good prospects, at salaries commensurate with qualifications and experience.

Apply with full particulars to the Chief Engineer, A. Reyrolle and Company Ltd. Hebburn, Co. Durham. (T 587)

BRUSH ELECTRICAL ENGINEERING CO., LTD., require a DEVELOPMENT ENGINEER for their Cardiff Works. The Applicant should have reached the H.N.C. standard and served a suitable apprenticeship in Electrical Engineering. Subsequent experience in a Design Office or Development Laboratory is necessary and first consideration will be given to men possessing some experience of problems of circuit interruption. The candidate should possess a positive approach to problems and should be capable of deducing practical solutions from work involving theoretical and experimental approach. Replies to Personnel Officer, Hopkinson Works, Birchgrove, Cardiff. (T 449)

BUYER. Experienced Buyer required for a cable company in the London area. An excellent opportunity for an experienced man over 30 years of age capable of dealing with raw materials and extensive engineering supplies. Applicants should state full details of previous experience. The post will be permanent and pensionable, with good prospects.—Box No. 4647, Electrical Times. (T 403)

BRUSH ELECTRICAL ENGINEERING CO., LTD., require a FUSE GEAR ENGINEER for their Cardiff Works. The Applicant should possess H.N.C. or a Degree in Electrical Engineering and his experience should include an apprenticeship in Electrical Engineering. Subsequent experience in the design of H.R.C.F. uses is necessary and it is important that the candidate possesses a flair for original design. The post is a senior one and carries some administrative responsibility. Replies to Personnel Officer, Hopkinson Works, Birchgrove, Cardiff. (T 448)

CANADA—Large Montreal Electronics company requires electronics ENGINEERS, electronics TECHNICIANS, electronics DRAUGHTSMEN, TECHNICAL ILLUSTRATORS and GYROSCOPE TECHNICIANS. High rates of pay; passage assistance; pension plan; group insurance; August interviews in United Kingdom. Write outlining qualifications to Department "A.C." Canadian Department of Labour, 61 Green St, London, W.1. (T 554)

CONSULTING ENGINEERS require ELECTRICAL INSPECTOR experienced in the erection, testing and commissioning of 3,300 V H.T. and 440 V L.T. Switchgear, remote control, motor starting equipment up to 500 h.p. Diesel Engine Generator Sets, Substation Plant and general distribution networks, also in Flameproof and Oil Installations an advantage. Apply Sir Bruce White, Wolfe Barry and Partners, 1 Lygon Place, S.W.1. SLOane 0431. (T 538)

JOHNSON & PHILLIPS LIMITED
WORKS MANAGER FOR PAKISTAN

APPLICATIONS are invited for the post of Works Manager for the Company's Switchgear Factory in Pakistan. The successful applicant will be required to take technical and administrative charge of the factory, which manufactures and assembles switchgear up to 11,000 V.

Applicants should have had sound technical and practical experience of the manufacture and application of L.V. and H.V. switchgear.

The factory is situated a few miles out of Karachi and is housed in modern buildings which have recently been extended.

The appointment will be a senior permanent one. Generous salaries with good U.K. leave and other conditions of employment will be offered to suitable applicants.

Candidates should preferably be not more than 35 years of age.

Applications (which will be treated in strict confidence) should be as complete as possible and should be addressed to:

The Managing Director,
Johnson & Phillips Limited,
Charlton, London, S.E.7.

(T 512p)

CAPABLE A.C. MOTOR REWINDER required for all sizes of motors in Midlands repair and maintenance workshop.—Box No. 4669, Electrical Times. (T 489)

CENTRAL ELECTRICITY AUTHORITY, Research Laboratories, Leatherhead, require PHYSICISTS. Candidates should have a University Degree or equivalent qualification in physics. Duties include research on problems associated with the generation and transmission of electricity and preference will be given to candidates with some experience of flame radiation, or temperature measurement, or particle mechanics, or X-ray diffraction. Salary within one of the following scales, according to qualifications and experience.

N.J.B. Grade 2, £925/£1,275 per annum.

N.J.B. Grade 3, £865/£1,075 per annum.

N.J.B. Grade 4, £675/£850 per annum.

GENERAL ASSISTANT ENGINEERS. Candidates should have a Higher National Certificate or equivalent qualification in electrical or mechanical engineering or physics. Duties include the maintenance of a wide range of specialised instruments. Salary N.J.B. Grade 5, £475/£650 per annum, according to qualifications and experience.

Applications, stating age, qualifications, experience, present position and salary to D. Moffat, Director of Establishments, Winsley St, W.1, by 10 Aug. Quote Ref.: AE/643. (T 573)

DESIGNER of Electrical Household Appliances. The G.E.C. Ltd. wishes to appoint an ASSISTANT TO THEIR CHIEF DESIGNER. He must have had considerable experience in this capacity and be able to initiate and follow up new ideas and have appreciation of economical productions. Age preferably 35/45. Full details of experience, qualifications and salary expected should be sent to the Secretary, G.E.C. Ltd., Landor St, Birmingham 8. (T 536)

DRAUGHTSMAN required for preparation of Wood Pole Line Drawings. High Rates paid. Permanency if suitable. Apply in writing in first instance to B. French Limited, Pike Mills, Green St, Kidderminster. (T 451)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2

JOHNSON & PHILLIPS LIMITED
CONTRACT MANAGER FOR PAKISTAN

APPLICATIONS are invited for the post of Contract Manager to take charge of the installation, contract and construction activities of the Company's Pakistan Organisation. Applicants should have had sound commercial and technical experience in the planning, tendering for, and supervision on site of industrial and other electrification schemes.

The Company's branch premises are situated a few miles out of Karachi and are housed in modern buildings which have recently been extended.

The appointment will be a senior permanent one. Generous salaries with good U.K. leave and other conditions of employment will be offered to suitable applicants.

Candidates should preferably be not more than 35 years of age.

Applications (which will be treated in strict confidence) should be as complete as possible and should be addressed to:

The Managing Director,
Johnson & Phillips Limited,
Charlton, London, S.E.7.

(T 513p)

DESIGNER/DRAUGHTSMEN. Crompton Parkinson Ltd., Doncaster, have vacancies for Designer/Draughtsmen for the mechanical development of F.H.P. motors. These positions offer splendid opportunity for men with ability and a generous salary is envisaged. There is ample scope for advancement within the organisation and the Company operates a Superannuation Fund to which employees contribute when eligible. Apply to Personnel Officer, giving details of qualifications, experience and age. (T 401)

DRAUGHTSMEN for Low Voltage Electrical Distribution Equipment including Joint Boxes and Terminations. 5-day week. Pension Fund. Apply in writing, stating age, details of experience and salary expected, to the Personnel Officer, W. T. Henley's Telegraph Works Co., Ltd., Gravesend. (T 458)

DEVELOPMENT ENGINEER (with Degree) required for telecommunication cables and testing equipment. Permanent and progressive position with pension scheme. Please apply, giving full particulars to—Box No. 4685, Electrical Times. (T 569)

SOUTH AFRICA
Engineers and Draughtsmen for Switchgear

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(T 474p)

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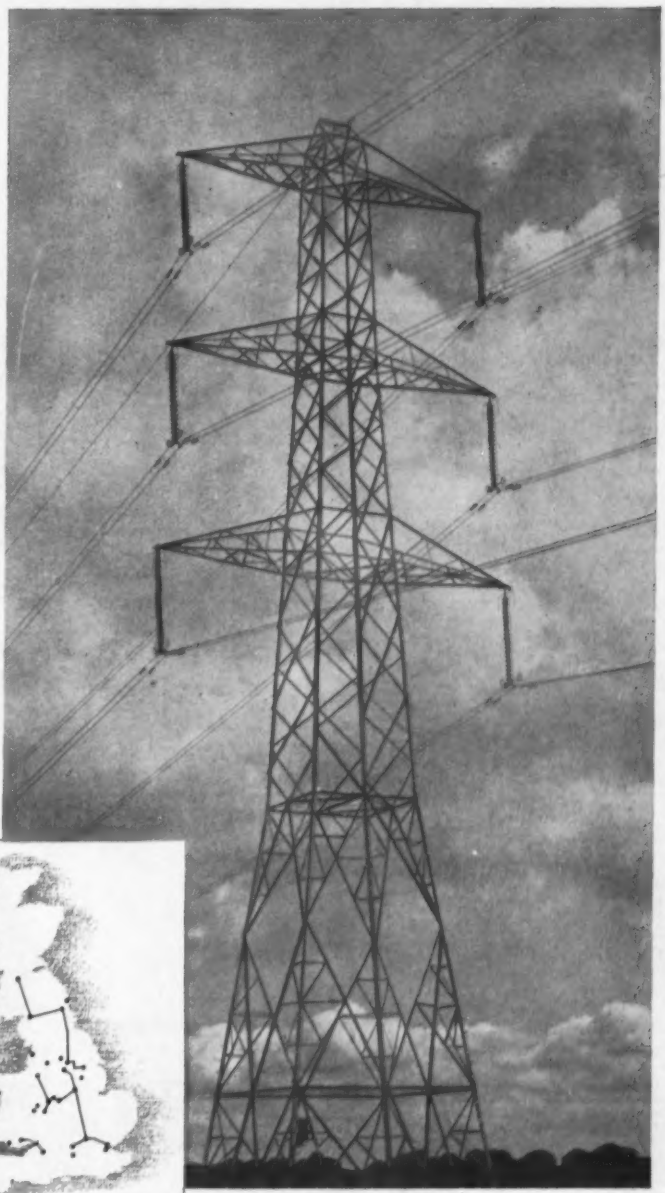

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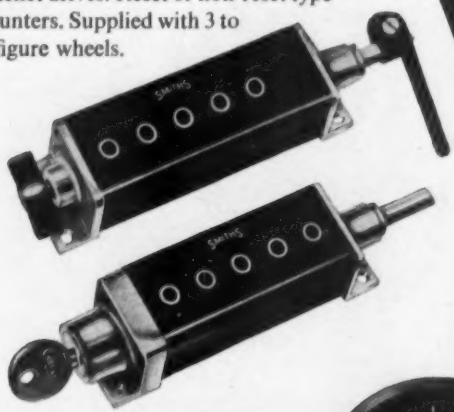

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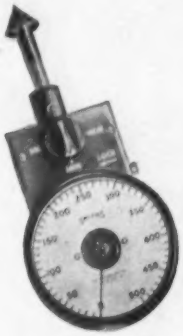

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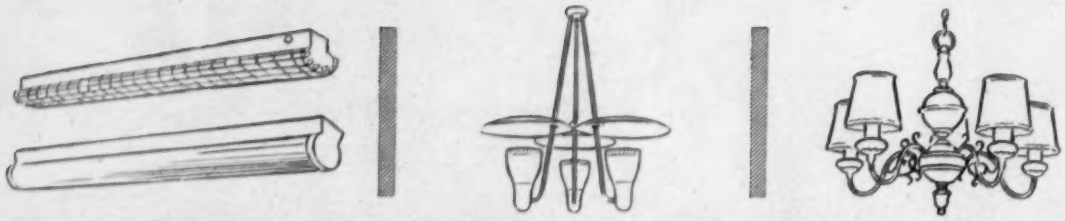

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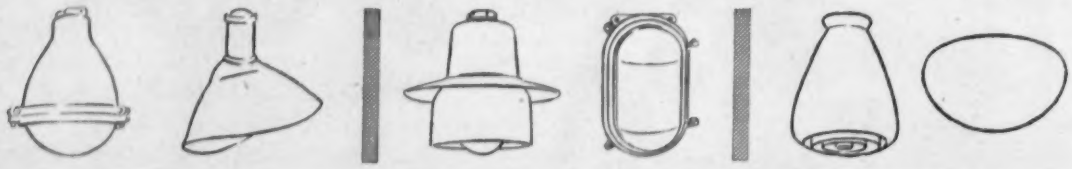

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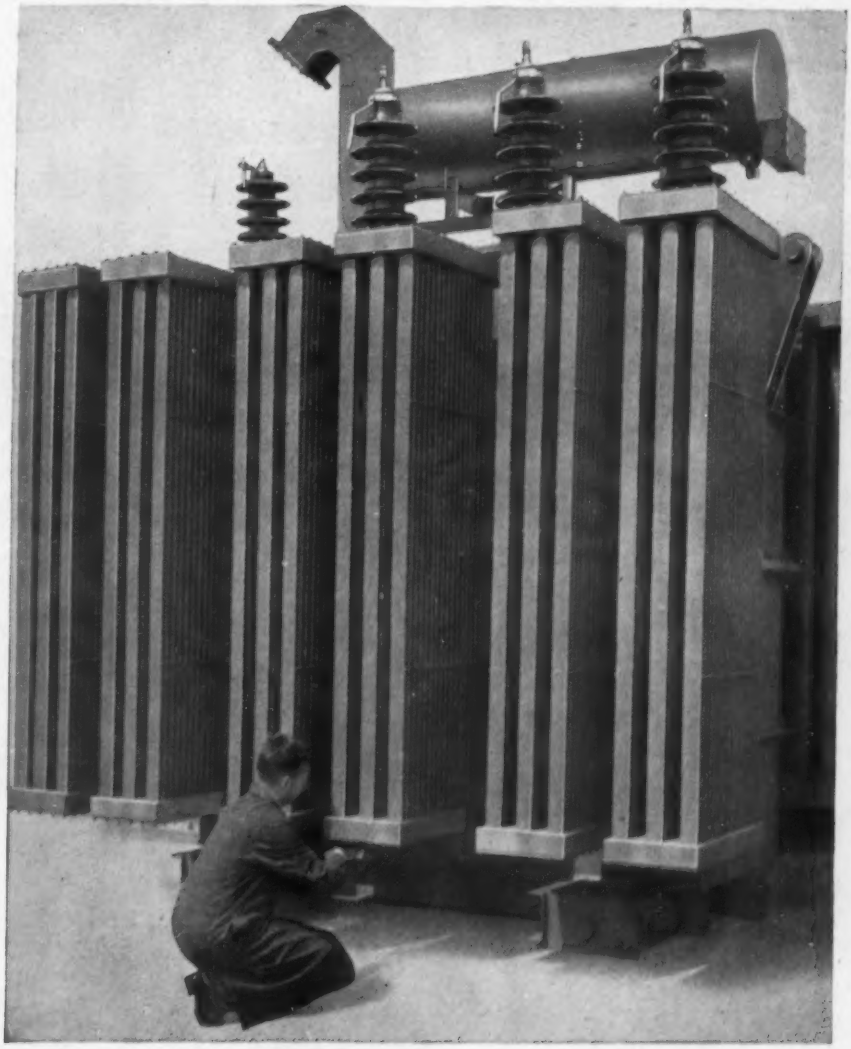

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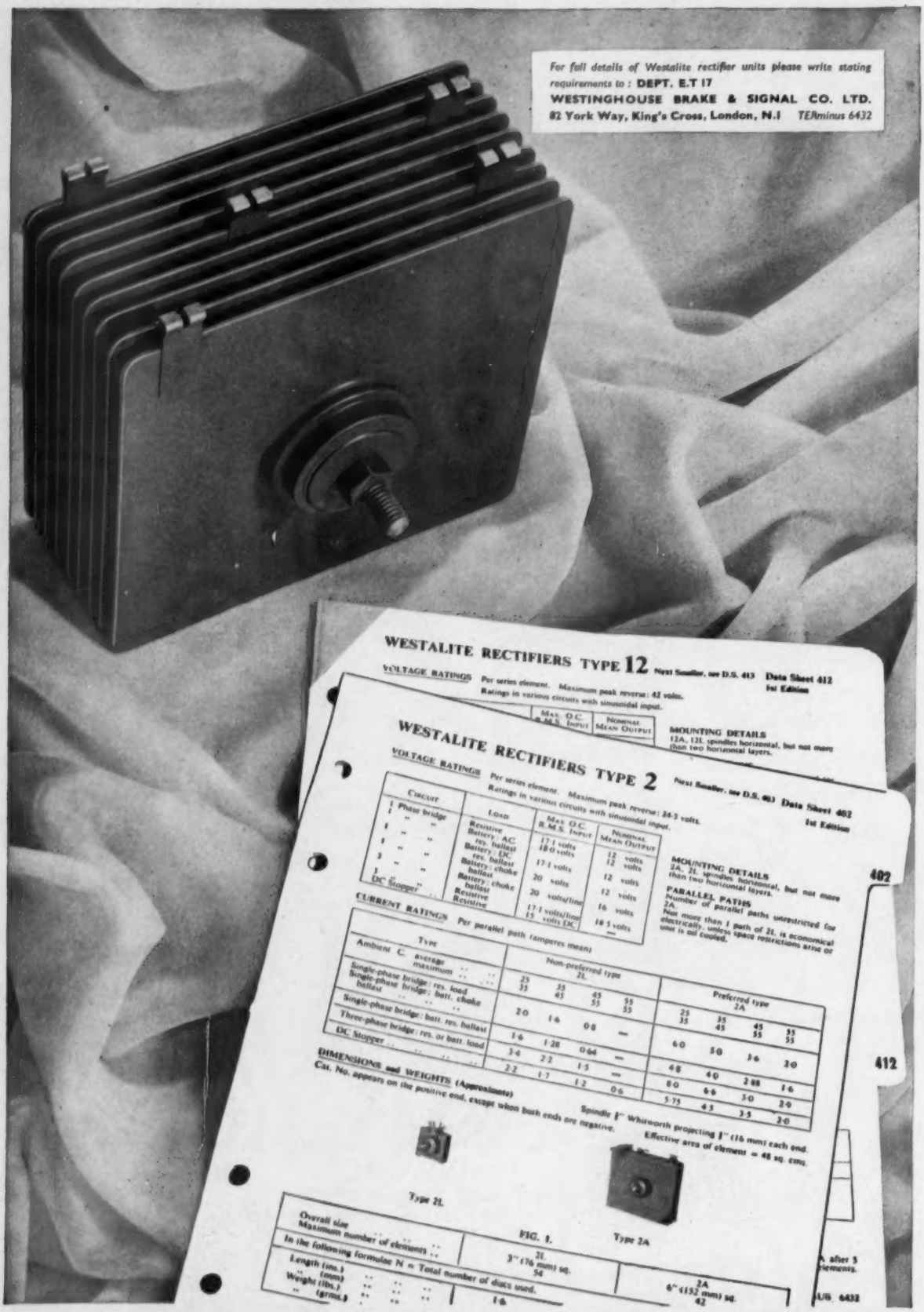

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